RISK AND PROTECTIVE FACTORS ASSOCIATED WITH WOMEN'S DEATHS IN HETEROSEXUAL RELATIONSHIPS

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Risk and protective factors associated with women's deaths in heterosexual relationships

Autora:

Esperanza García Vergara

Directores:

Dr. David Becerra Alonso y Dra. Blanca Martín Ríos

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Dedicated to all those women
who have died on the
hands of their partners.

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RESUMEN Y PALABRAS CLAVES

Introducción: En los últimos años ha aumentado la preocupación por la violencia de género por su alta incidencia y gravedad. Este tipo de violencia ha acabado con la vida de miles de mujeres en todo el mundo. Este problema se sigue produciendo en la actualidad, no habiendo sido posible erradicarlo aún. Los profesionales del área indican que el conocimiento sobre las muertes por violencia de género es escaso. Por este motivo, consideran necesario investigar más sobre los factores de riesgo y protección que ayuden tanto a predecir como prevenir futuras muertes.

Objetivos: El objetivo general es analizar los factores de riesgo y protección asociados a las muertes por violencia de género. Para ello, se han determinado dos objetivos específicos. El primero es examinar los factores individuales que aumentan o disminuyen la probabilidad de las muertes por violencia de género. El segundo es analizar la combinación entre esos factores individuales que aumentan o disminuyen la probabilidad de las muertes por violencia de género.

Método: Se han realizado dos estudios con métodos diferentes. El primero es una revisión sistemática sobre los factores de riesgo y protección de las muertes por razones de género. Esta investigación ha sido realizada con las directrices de la guía PRISMA. Los artículos científicos incluidos proceden de las bases de datos Dialnet Plus, Web of Science (WOS), Pubmed, Criminal Justice, Academic Research Ultimate, APA Psyarticles, Psychology and Behavioral Sciences Collection y MEDLINE. El segundo consiste en un análisis relacional en el que se ha utilizado aprendizaje supervisado, como categoría de la inteligencia artificial y el aprendizaje automático, para aplicar técnicas y algoritmos que detecten los factores asociados a las muertes y ayuden a su predicción. Este estudio se desarrolló con datos secundarios de la base de datos jurídica Vlex, formando dos grupos compuestos por violencia de género y muertes por razón de género.

Resultados: Existen factores de riesgo individuales del agresor, de la víctima, de la relación de pareja y del ambiente asociados a las muertes por violencia de

género. También existen factores de protección individuales del agresor, de la relación de pareja y del entorno del mismo fenómeno de estudio. Ciertos factores individuales en combinación con otros potencian o debilitan el resultado de la muerte, dependiendo de la naturaleza y el número de factores de agrupación.

Discusión: El presente estudio contribuye al conocimiento de los factores de riesgo y protección de las muertes por violencia de género, refutando o validando los estudios anteriores. Además, aporta nuevos hallazgos que podrían ser fundamentales para una predicción y prevención más eficaz de las muertes. De este modo, el presente estudio tiene un impacto en las vidas de las mujeres.

Palabras clave: violencia contra la mujer, muertes por razones de género, factores de riesgo y factores de protección.

ABSTRACT AND KEY WORDS

Introduction: In recent years, there has been a growing concern about gender-based violence. This is due to its high incidence and severity. This violence has taken the lives of thousands of people around the world. This fatal outcome is still occurring today, so it has not yet been possible to eradicate. Professionals in the area indicate that knowledge about deaths due to gender-based violence is scarce. For this reason, they consider that more research on the phenomenon is essential to know the risk and protective factors that help to predict and prevent future deaths.

Objectives: The general objective is to analyze the risk and protective factors associated with gender-based deaths. For that purpose, two specific objectives have been determined. First, to examine individual factors that increase and decrease the probability of gender-based deaths. Second, to analyze the combination of individual factors that increase and decrease the probability of gender-based deaths.

Method: Two studies have been carried out with different methods. The first study, using the standards of the PRISMA guide, consists of a systematic review

about the risk and protective factors of gender-based deaths. The scientific articles included on the study comes from Dialnet Plus, Web of Science (WOS), Pubmed, Criminal Justice, Academic Research Ultimate, APA Psyarticles, Psychology and Behavioral Sciences Collection and MEDLINE databases. The second study consists of a relational study, using supervised learning, as a category of artificial intelligence and machine learning, to apply techniques and algorithms that detect the factors associated to deaths and predict them. This study was developed with secondary data of Vlex legal database, forming two groups composed by gender-based violence and gender-based deaths.

Results: There are individual risk factors of aggressor, victim, partner's relationship and environment of gender-based deaths. There are also individual protective factors of aggressor, partner's relationship and environment of the same study phenomenon. Certain individual factors in combination with others enhance the death result or prevent it, depending on the nature and number of grouping factors.

Discussion: The present study contributes to the knowledge of risk and protective factors for gender-based deaths, refuting or validating the previous studies about that. Moreover, it provides new findings which could be fundamental for a more effective prediction and prevention of gender-based deaths. In this way, the present study has an impact on saving women lives.

Key words: violence against women, gender-based deaths, risk factors, and protective factors.

CHAPTER 1. INTRODUCTION

1.1. Violence against women as a social problem

Violence against women is a phenomenon that has occurred throughout history mainly due to social roles that have placed men in a position of superiority and dominance over women (Bosch & Ferrer, 2000). In previous times, male violence against women in a partner's relationship has been normalized and socially legitimized (Cordero, López & Guerrero, 2017). In recent years, there has been growing concern about the high incidence and severity of violence suffered by women at the hands of their husbands or partners (González & Camacho, 2014; Morillas, Patró & Aguilar, 2014). In the most extreme cases, the violence against women results in women deaths. At an international level, approximately 50,000 women die as a result of this type of violence each year (United Nations Office on Drugs and Crime, 2019). At a national level, records collect around 56 mortal victims of gender violence each year (Ministry of Equality of the Spanish Government, 2020).

The awareness of the problem as a serious human rights violation of the victims such as the right to life, physical integrity, personal freedom, a life free from violence, and security and judicial protection has led International, European and National law to consider the need for prevention, protection and penalization of violence against the women (United Nations, 1948). Focusing on the international level, it is important to highlight the Universal Declaration of the Human Rights, the Convention on the Elimination of All Forms of Discrimination against Women, the Declaration of the Elimination of Violence Against Women and the Handbook of the United Nations Conventions about the Legislation on violence against women. The Charter of Fundamental Rights of the European Union of 2000 and the Council of Europe Convection on preventing and combating domestic violence and violence against women are examples of European measures. At a national level, the most important advances are reflected on the Spanish Organic Law 1/2004, Spanish Organic Law 3/2007 and reforms of the Spanish Organic Law 10/1995, of Penal Code.

Despite the fact that legal regulations try to solve the problem, cases of violence against women and the deaths resulting from it continue to occur (Ministry of Equality of the Spanish Government, 2020). In this regard, some researchers have paid attention to this phenomenon in order to understand it and with that knowledge carry out actions for prediction, prevention and control (Cunha & Gonçalves, 2016; Ward-Lasher, Messing, Cimino & Campbell, 2020). It is considered that there are numerous and complex factors which are not known yet that preserve these deaths and hamper their identification and prevention (Campbell, Glass, Sharps, Laughon, & Bloom, 2007; García, Soria & Hurwith, 2007; Spencer & Stith, 2020; Shilan, Kristianssn, Granath & Sturup, 2017). There are a large number of studies on gender-based violence; however, research on deaths caused by this type of violence is more limited (Anderson, McClelland, Meyer, Krause, Garcia & Koss, 2019; Bacchus, Ranganathan, Watts & Devries, 2018; Contreras, 2014). Scientists in the area reveal that research on these deaths is scarce, considering it necessary to know the factors associated with it in order to understand better the phenomenon and thus be able to prevent it (Contreras, 2014; López-Ossorio, Carbajosa, Cerezo-Domínguez, González-Álvarez, Loinaz & Muñoz-Vicente, 2018). A knowledge of factors associated with these deaths is essential for professionals who are in contact with aggressors and victims to predict effectively the cases of violence against women with high risk of death and manage their resources efficiently (Campbell, Glass, Sharps, Laughon, & Bloom, 2007; Cunha & Gonçalves, 2016).

1.2. Defining concepts related to violence against women

The Council of Europe Convention on Preventing and combating violence against women and domestic violence (2011) define gender-based violence or violence against women as "*a violation of human rights and a form of discrimination against women and shall mean all acts of gender-based violence that result in, or are likely to result in, physical, sexual, psychological or economic harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or in private life*". In consonance with this concept, any institution or person who exercises violence against women because of her gender is considered an aggressor of gender-based violence,

independently if the offender is familiar as a partner, friend, family or unknown to the victim.

The previous definition is not effectively applied in all European countries. In Spain, legal regulations and doctrine consider gender-based violence as the violence exercised by a man against a woman who is or has been his wife or intimate partner, even if there is not cohabitation (Ley Orgánica 1/2004, de 28 de diciembre, de Medidas de protección Integral contra la Violencia de Género; Sentence by Spanish Supreme Court number 677, 2018). The Spanish Penal Code punishes for gender-based violence men that meet the last characteristics, excluding the violence exerted by another men. Violence perpetrated against women by a father, brother or other man member of her family who is not the victim's husband, ex-husband, partner or ex-partner is considered domestic violence which is punishable as an independent juridical category (Gimeno & Barrientos, 2009; Ley Orgánica 10/1995, de 23 de noviembre, del Código Penal).

According to the Spanish legal regulations, domestic violence includes all violence exercised in the family nucleus, including the offenses of women against men who are their husbands or partners, mutual violence in homosexual partners and among the family member, such as violence used against the grandparents, parents or children (Ley Orgánica 10/1995, de 23 de noviembre, del Código Penal). The law of some countries uses domestic violence as a synonym of gender-based violence, but in the Spanish judicial context they do not acquire the same meaning (Concepción, 2015).

In spite of these conceptual differences, many scientific studies have used all of mentioned concepts to refer to the violence that women suffer from their husbands, ex-husbands, boyfriends or ex-boyfriends (Soares & Abrunhosa, 2016; Spencer & Stith, 2020; García, Malinski & Brenner, 2020). Furthermore, 'intimate partner violence' is another term used by the scientific studies to refer to the physical and psychological violence perpetrated by a woman or a man against the other in a partner's relationship (Bogat, García & Levendosky, 2013; Cunha & Gonçalves, 2016). As mentioned before, the term 'intimate partner

violence' includes both gender-based violence and domestic violence as from the categories proposed by the Spanish legislation.

In relation to the deaths of women produced by their husband, ex-husband, male partner or ex-partner, the scientific field uses the concepts of gender-based homicide, intimate partner homicide and femicide (McFarlane, Campbell, Wilt, Sachs, Ulrich & Xu, 2014; Sebire, 2015; Kivisto, 2015; Rai, Villareal-Otálora, Blackburn & Choi, 2020). However, the most extended use of the term 'femicide' refers to all homicides or murders against women because of the gender (World Health Organization, 2012). Moreover, the use of 'intimate partner homicide' is commonly used to refer deaths that occur between women and men in a partnership indistinctly, and between homosexual partners (Bridger, Strang, Parkinson & Sherman, 2017; Hanlon, Brook, Demery & Cunningham, 2015).

The deaths by gender-based violence could be produced by homicide or murder, being both crimes against the life that constitute different legal subcategories. Specifically, 'homicide' occurs when someone kills a person, whereas 'murder' refers to the same act with some specific characteristics which are malice aforethought, overkill, price, reward or promise, or facilitating the commission of another crime or preventing its discovery (Ley Orgánica 10/1995, de 23 de noviembre, del Código Penal).

In the current study, the terms of 'violence against women' and 'gender-based violence' have been used as indicated by the Spanish norms. Moreover, the deaths by gender-based violence will be refered as 'gender-based homicides' and 'gender-based deaths' terms, including them both homicides and murders categories.

There are risk and protective factors of the gender-based deaths (Contreras, 2014). Risk factors are those that increase the probability of occurrence of criminal behavior whereas protective factors decrease that probability, minimizing or buffering the effects of risk factors (Farrington, Loeber & Ttofi, 2012). Despite these definitions, in the present study these concepts are

used to include also those factors that are associated with death although their contribution in terms of probability to death is unknown. This is done in order to cover a greater number of factors that make it possible to better understand the phenomenon under study.

CHAPTER 2. OBJECTIVES

The purpose of the present study is to contribute to a comprehensive knowledge of factors associated with gender-based deaths to prevent further deaths of women in intimate partner relationships. For this reason, the main objective is analyzing the risk and protective factors associate with gender-based deaths. To achieve the main objective, specific objectives have been determined:

1. To examine the individual factors that increase and decrease the probability of gender-based deaths.

2. To analyze the combination of the individual factors that increase and decrease the probability of gender-based deaths.

In order to respond the objectives, two studies were proposed. The first study integrates the actual scientific evidence of the risk and protective factors of gender-based deaths through the development of a systematic review. The second study looks into the non-studied risk and protective factors related to the mentioned deaths through a relational study to extent the knowledge of it.

CHAPTER 3. STUDY 1: SYSTEMATIC REVIEW

3.1. Importance of the study

In recent decades, several studies have paid attention to risk factors of intimate partner homicide. Multiple researchers have integrated these results in systematic reviews and meta-analysis (Campbell, Glass, Sharps, Laughon & Bloom, 2007; Garcia, Soria & Hurwitz, 2007; Matias, Gonçalves, Soreiro & Matos, 2019; Spencer & Stith; 2020). However, these studies do not distinguish the sex of the victim and aggressor, including integrally as study population the homicides from men to women, from women to men, from men to men and from women to women. Therefore, they interfere to obtain a comprehensible knowledge of gender-based homicides which constitutes a different phenomenon of homicides produced by domestic violence, principally by the inequality between women and men by patriarchy and machismo (Barker, 2016; Tonsing & Tonsing, 2019).

Regarding the scientific literature about risk factors of gender-based homicides, only one systematic review and no meta-analysis have been found (Contreras, 2014). The unique systematic review for the moment indicates that there are risk factors related to the aggressor, the victim, the partner's relationship and the environment. In relation to the aggressor, being an immigrant, being unemployed, having weapons, and having a history of violence against family, friends and previous partners increase the probabilities of killing his female partner or wife. Nevertheless, it is not clear if the diagnosis of psychopathy and the dependence of alcohol or drug abuse are risk factors, existing contradictories studies.

Respecting the victim, the African American race, vulnerability by illness or dependence to the aggressor, irrational and violent jealousies, and justifications of violence increase the probabilities of a woman being killed by her male partner or husband. There is contradictory evidence of pregnancy regarding if it is a risk factor of gender-based homicide or not. Concerning the partner's relationship, the cohabitation, rupture, previous violence from the man to the woman, stalking, sexual aggression and threats are identified as risk factors.

Regarding environment, the escape of the aggressor from a detection from institutions and non-compliance of proximity orders to the victim increases the probability of gender-based homicide occurring. There is controversy about the effects of prevention programs on gender-based homicides. Some studies reveal that such programs increase the likelihood of homicide, but there is not enough evidence to prove such affirmation yet (Contreras, 2014).

The mentioned systematic review has some limitations. Firstly, it has not focused on protective factors of gender-based homicide. Knowledge of these factors is as necessary as the knowledge of risk factors concerning identification of cases with death risk and its prevention. Secondly, its results are not updated, given that, since its publication, scientific studies of this topic have been developed (Bagwell-Gray, 2016; Cunha & Gonçalves, 2016; Ward-Lasher et al, 2020). A new systematic review or a meta-analysis would be necessary to integrate the actual scientific studies of risk and protective factors of gender-based deaths. It is faced on the present study number 1.

3.2. Method

The systematic review has proceeded with the Preferred Reporting Items of Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Moher, Liberati, Tetzlaff & Altman, 2009) in order to carry it out with high scientific rigor. The PRISMA guidelines include a checklist consisting of 27 items with information about the points to get an adequate scientific review and a flow diagram, which are used in this study (Hutton, Catalá-López and Moher, 2016). Even though the guide was initially used in the Health framework (Martín-Gómez, Moreno-Peral, A Bellón, Conejo, Campos-Paíno, Gómez, Rigabert, Benítez, & Motrico, 2020), it has been adapted and applied to other areas of research (Almeda, García-Alonso, Salinas-Pérez, Gutiérrez-Colosía & Salvador-Carulla, 2019), as it is in the present study. The use of the PRISMA guideline with the PICO research question in systematic reviews and meta-analysis about violence against women is a necessary innovation of its traditional applications, given that the standardized guidelines are not being used in this area yet (Campbell, Glass, Sharps, Laughon & Bloom, 2007; Spencer & Stith, 2020).

3.2.1. Search strategy

The search strategy was designed on the PICO research question model adapted from the Health framework (Flemming, 1999; Santos, Pimenta, & Nobre, 2007) (Table 1). The research question is: What are the risk and protective factors associate with gender-based homicides?

Table 1. Description of the PICO question components.

Population (P)	All adult offenders of violence against women homicide and their victims killed or survivors of attempted
Intervention (I)	Methods to identify risk and protective factors
Comparison (C)	Gender-based violence maltreatment and homicide
Outcome (O)	Risk and protective factors of gender-based homicide

Encompassing population, intervention, comparison, and outcome PICO components, the Spanish key words used in the search strategy were ‘violencia de género’, ‘violencia contra la mujer’, ‘homicidio’, ‘asesinato’, ‘muerte’, ‘factores’. The English key words used were ‘gender violence’, ‘gender-based violence’, ‘intimate partner violence’, ‘intimate partner aggression’, ‘violence against women’, ‘domestic violence’, ‘homicide’, ‘mortality’, ‘factors’, ‘characteristics’ and ‘causes’. These terms were identified on the thesaurus of Psyinfo and in different studies of the same theme (Aguilar, 2019; Campbell et al, 2007; Martin, Halpern, Schoenbach, 2010; Spencer, & Stith, 2020).

The search of scientific articles was conducted on January 3rd, 2021 through the databases of Dialnet Plus, Web of Science (WOS), Pubmed, Criminal Justice, Academic Search Ultimate, APA Psyarticles, Psychology and Behavioral Sciences Collection and MEDLINE. The search in the last five databases was conducted from Magis Discovery. The key words mentioned above were included in these databases, limiting the search by title and abstract and using the Boolean operators AND, OR and NOT, as shown in Table 2.

Table 2. Search strategy piloted in Pubmed.

1. “gender violence” (title/abstract)
2. “gender based violence” (title/abstract)
3. “intimate partner violence” (title/abstract)
4. “intimate partner aggression” (title/abstract)
5. “violence against women” (title/abstract)
6. “domestic violence” (title/abstract)
7. “Homicide” (title/abstract)
8. “Mortality” (title/abstract)
9. (1 OR 2 OR 3 OR 4 OR 5 OR 6) AND (7 OR 8)
10. “Factors” (title/abstract)
11. “Characteristics” (title/abstract)
12. “Causes” (title/abstract)
13. (1 OR 2 OR 3OR 4 OR 5 OR 6) AND (7 OR 8) AND (10 OR 11 OR 12)
14. “Suicide” (title/abstract)
15. “Assessment” (title/abstract)
16. (1 OR 2 OR 3OR 4 OR 5 OR 6) AND (7 OR 8) AND (10 OR 11 OR 12) NOT (14) NOT (15)

3.2.2. Inclusion and exclusion criteria

Scientific studies were selected and excluded according to a set of criteria following below.

The inclusion criteria of the present study are composed by articles which (a) identify personal characteristics of aggressors, victims and relationship of homicides of women in intimate partners, (b) detect environmental factors associated with women homicides by their partner or ex-partners, (c) are empirical articles or (d) academic publications, (e) incorporate adult participants, (f) are in Spanish or English language and (g) are accessible in full text.

The exclusion criteria are integrated by articles which (a) focus on the parasuicide of the aggressor after the homicide of women or (b) focus on the suicide of gender-based violence victims, (c) identify precipitant and maintainers factors of gender-based violence, (d) examine gender based-violence as a risk factor of familicide, (e) study exclusively women offenders of intimate partner

homicides, (f) analyze risk assessment instruments of homicide in gender-based violence victims, (g) assess therapeutic programs of gender-based violence victims survivors of homicide, (h) aim at prevention of gender-based violence, (i) develop a juridical analysis of homicides of women in intimate partners, (j) provide statistical data of homicides, (k) examine case studies, (l) analyze homicides from mass media information discipline, (m) make offender's classification of homicide by intimate partner violence, (n) study uniquely femicide cases, (ñ) incorporate homosexual partner homicides or (o) adolescents and elderly participants of homicide against women in a partnership.

3.2.3. Quality assessment

To evaluate the quality of the scientific studies included in this systematic review, Mixed Methods Appraisal Tool (MMAT) guideline (Hong, Fàbregues, Barlett, Boardman, Cargo, Dagenais, Gafnon, Griffihs, Nicolau, O'Cathain, Rousseau, Vedel & Pluye, 2018; Hong, Pluye, Fàbregues, Barlett, Boardman, Cargo, Dagenais, Gafnon, Griffihs, Nicolau, O'Cathain, Rousseau & Vedel, 2019) has been used, which includes a checklist with items to assess the quality of quantitative, qualitative and mixed studies in a systematic review. It is the unique efficient appraisal tool focused on the methodology criteria of different study design simultaneously (Hong et al, 2018). For this reason, and given that this quality assessment tool has been applied to systematic reviews related to intimate partner violence theme (Anderson et al, 2019; Apiribu, Ncama, & Joseph-Shehu, 2019; Maguele, Taylor, & Khuzwayo, 2020), it has been selected as well for the quality assessment of the present study.

3.3. Results

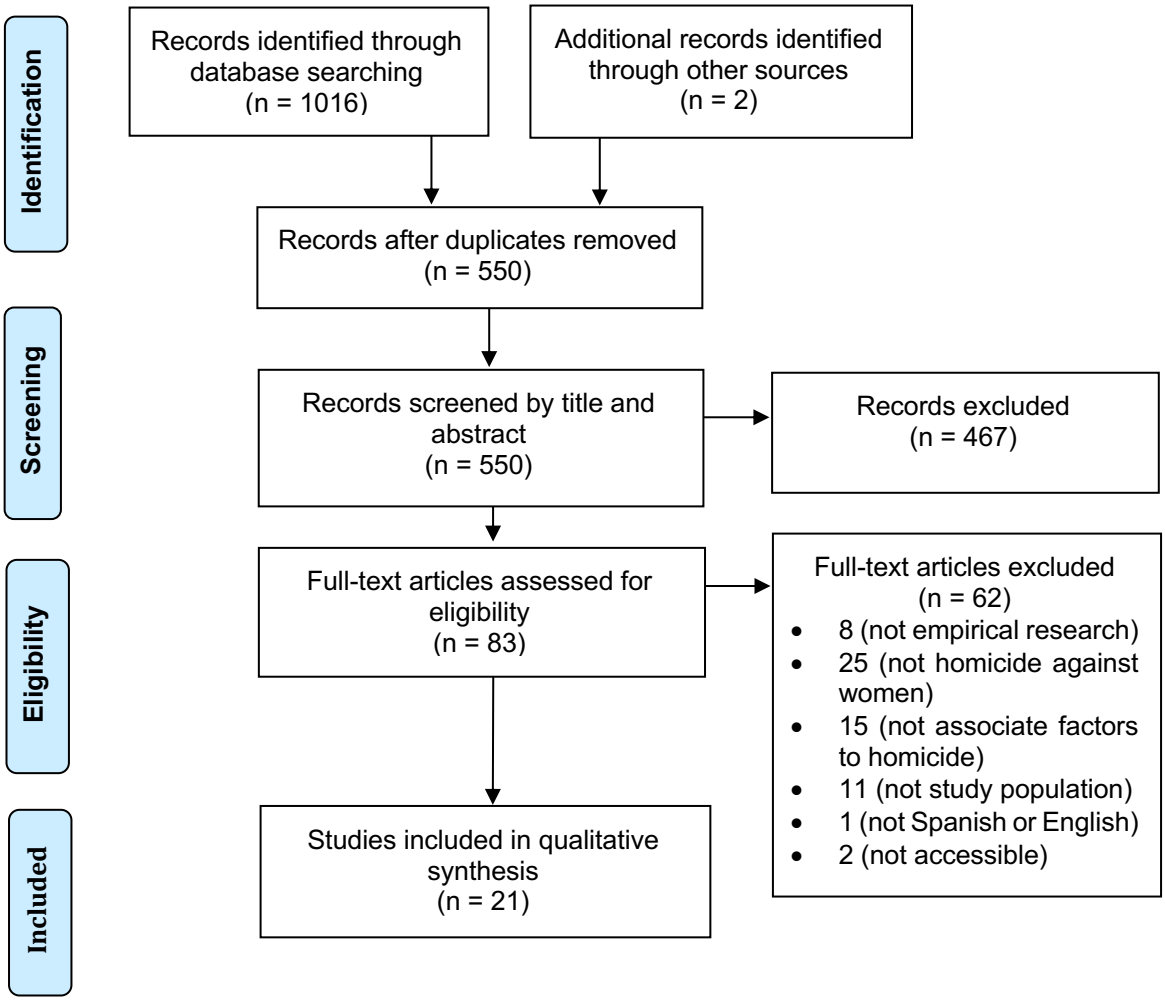
3.3.1. Studies selection

Once the search was performed, a total of 1016 articles were obtained: 40 from Dialnet Plus, 387 from Web of Science (WOS), 27 from Pubmed and 562 from Criminal Justice, Academic Search Ultimate, APA Psyarticles, Psychology and Behavioral Sciences Collection and MEDLINE. In addition, 2 relevant articles

were obtained from a reading of the bibliographic references of some articles obtained in the search of the databases mentioned (Figure 1).

Afterwards, 466 articles were removed as duplications and the remaining 550 articles were analyzed after reading their titles and abstracts. According to the inclusion and exclusion criteria 467 articles were eliminated and the remaining 83 articles were fully read. From that analysis, 62 articles were removed by the inclusion and exclusion criteria. Subsequently, 21 articles were included in the present systematic review.

Figure 1. Flow diagram of the studies selection (Moher, Liberati, Tetzlaff, & Altman, 2009).



3.3.2. Quality assessment of the included studies

The quality assessment of the selected studies has been carried out in three parts according to the Mixed Methods Appraisal Tool (MMAT) guideline (Hong et al 2018; Hong et al, 2019), one for each research method (quantitative, qualitative and mixed). The results of the quality assessment are shown in Appendix 1 which shows good ratings.

Concerning the quality assessment of the quantitative method studies, all of them comply with the criteria of ‘sample representativeness’, ‘appropriate measures’, ‘low risk of nonresponse bias’ and ‘appropriate statistical analysis’. However, 10 articles have not research question and therefore they do not comply with the criteria of ‘clear research questions’, ‘the collected data allows the research questions’ nor ‘the sampling strategy is relevant to address the research question’. The rest of the articles comply with these standards. In addition, the 10 mentioned articles have outstanding research objectives and methodology, and 8 of them are studies with high impact and relevancy by the Journal Citation Report, therefore, they remain in the systematic review.

Regarding the qualitative method studies, they meet the quality requirements except for the research questions, since 1 article does not include it and the other 2 do not display them clearly. Despite this fact, the studies have clear research objectives and good methodology, and the majority of them have high relevance by the Journal Citation Report, so they are maintained for the systematic review.

Finally, the studies with mixed method meet all items as well as they have a high impact on the Journal Citation Report, so it is clear that they have an excellent quality to keep them in the systematic review.

3.3.3. Risk and protective factors findings

In the present systematic review, the scientific studies identified some risk and protective factors of gender-based deaths in a partner's relationship, which are exposed below and illustrated in Appendix 2.

3.3.3.1. Risk factors of gender-based deaths

According to the scientific studies, there are specific personal characteristics of the aggressor and the victim which act as risk factors referring to the gender-based deaths. Certain features of the partner relationship between aggressor and victim, as well as particular environment circumstances are also risk factors of this phenomenon.

A. Risk factors of the aggressor

There are socio-demographic characteristics of the aggressors associated with the gender-based deaths. These are age, education level, employment situation, socio-economic status and ethnicity. The age difference between the man and the woman matters on the risk of death, being considerably common for aggressors to be older than the victims (Sebire, 2017; Soares & Abrunhosa, 2016).

Men with elementary education have more risk of perpetrating a gender-based death crime (Fernández & Echeburúa, 2005). Moreover, the low-medium socio-economic status is another factor that increases the risk of death being committed, and the risk is even greater if the men in question are unemployed and receive neither unemployment benefit nor a pension (Cunha & Conçalves, 2016; Fernández & Echeburúa, 2005). Furthermore, the lack of work due to being retired or being the responsible person for the household chores are also risk factors of death (Sevire, 2017; Kivivuori & Lethi, 2012; Ward-Lasher, Messing, Cimino & Campbell, 2020).

Immigrant men have more probabilities of killing their women partners, owing to the fact that they usually possess several risk factors such as being a member of an ethnic minority group, unemployment, lack of economic resources, low socio-economic status, low education and excessive stress (Aguilar, 2019; Belfrage &Rying, 2004; Cunha & Conçalves, 2016; Fernández & Echeburúa, 2005; Sebire, 2017; Ward-Lasher, Messing, Cimino & Campbell, 2020). The risk factor of death increases when their female partner is also immigrant and comes from the same ethnic background (Belfrage &Rying, 2004).

In regard to the biography of gender-based death aggressors, the history of criminal acts in adulthood is the strongest predictor factor of this type of death (Belfrage & Rying, 2004; Dobash & Dobash, 2016; Monckton, 2019; Sebire, 2017; Soria-Verde, Pufulete & Álvarez-Llaberia, 2019; Kivivuori & Lethi, 2012). Men who have been arrested and condemned to a protection order or prison for an offense have more probabilities to perpetrate gender-based death (Dobash & Dobash, 2016; Monckton, 2019; Kivivuori & Lethi, 2012). However, the arrest by gender-based violence by itself does not significantly associate with death risk (Ward-Lasher et al, 2020). The criminal records due to a violent offense to previous intimate partners or family members and/or violent conflicts with them, especially if violence was accompanied by controlling patterns from the offender, increase more the probability of death (Abrunhosa, Castro, Cruz, Gonçalves & Cunha, 2020; Dobash & Dobash, 2011; Monckton, 2019).

Family problems during their childhood are common between the aggressors, some of them having been physically abused by familiar members in this period; this is another risk factor for men to commit homicide to women (Dobash & Dobash, 2016). However, several aggressors had also school problems in their infancy related to behavioral and learning problems, and such problems have become risk factors too (Dobash & Dobash, 2016). These problems could have an impact on the

aggressor's mental health, which is an important predictor for gender-based death (Aguilar, 2019). Psychiatric diagnoses of affective disorder, psychotic disorder and personality disorders are strong risk factors of death (Belfrage & Rying, 2004; Soares & Abrunhosa, 2016). Suicidal ideations or attempts in the aggressor, typical of affective disorders, increase markedly the risk of homicide, since the dangerousness of oneself put in risk the physical integrity and life of other people as well (Belfrage & Rying, 2004).

Moreover, substance abuse or dependence is another disorder which increases the risk of death (Belfrade & Rying, 2004; Dobash & Dobash, 2016; Johnson, Cusano, Nikolova, Steiner & Postums, 2020; Kikivuori & Lethi, 2012; Soares & Abrunhosa, 2016), being it higher when the aggressor's consumption, in spite of being conscious of the drugs and alcohol effects, leads to more violent acts towards their partners and they continue consuming them (Kivivuori & Lethi, 2012). Furthermore, this risk of homicide also increases when both aggressor and victim suffer substance abuse -including alcohol and/or drugs- (Belfrade & Rying, 2004).

The mental disorders potentiate the risk factors of homicide when the aggressors have specific cognitions as distorted beliefs about the subordinate position of the women to him and the justification of violence to keep it by cognitive neutralization techniques (Dobash & Dobash, 2011; Fernández & Echeburúa, 2005). In particular, men who use violence and blame the victim or environmental circumstances, minimizing or denying the damage caused to the victim by considering that it is necessary and believing that the victim deserves it, have more probabilities to kill their partners (Dobash & Dobash, 2016; Fernández & Echeburúa, 2005; Monckton, 2019; Soares & Abrunhosa, 2016). The rigid cognitions of men about authority, possessiveness and control over women result in an immense fear of abandonment of their partner through separation or divorce, perceiving lost control of her and their partnership, which is a risk factor of gender-based death (Dobash & Dobash, 2011; Monckton, 2019;

Nicolaidis, Curry, Ulrich, Sharps, McFarlane, Campbell, Gary, Laughon, Glass & Campell, 2003).

Extreme jealousy of perpetrators by the presence of the mentioned cognitions is a risk factor of homicide as well (Aguilar, 2019; Bagwell-Gray, 2016; Dobash & Dobash, 2011; Johnson et al, 2020; Nicolaidis et al, 2003; Soares & Abrunhosa, 2016), and followed by the imaginary or real assumption that the victim is dating another man increases much more the risk (Aguilar, 2019). Additionally, the lack of empathy and remorse in the aggressor also increases the probability of gender-based death (Dobash & Dobash, 2011; Dobash & Dobash, 2016).

The dysfunctional cognitive schemas of aggressors are reflected in some behavioral problems which predispose to the gender-based death. In particular, the aggressors' beliefs of subordination of the women to the men lead to possessiveness and control acts over the victims (Dobash & Dobash, 2011; Dobash & Dobash, 2016; Johnson et al, 2020; Monckton, 2019). The aggressors' efforts to isolate the victim, the high opposition to the last partner of the victim and the use of violence and weapons are forms of keeping their power and domain over the victims which act as risk factors of homicide (Bagwell-Gray, 2016; Johnson et al, 2020; Monckton, 2019; Reckdenwald, Szalewski & Yohros, 2018).

Concerning the purchase, access and use of weapons, especially of guns, these are strong risk factors of gender-based death, and even more if the aggressor had used them in the past (Aguilar, 2019; Abrunhosa et al, 2020; Cunha & Conçalves, 2016; Johnson et al, 2020; Monckton, 2019; Reckdenwald, Szalewski & Yohros, 2019; Soares & Abrunhosa, 2016). Mainly, the use of weapons by men in sexual offenses in which the victim is intimidated to get the desired sexual activity increases considerably the risk of homicide (Bagwell-Gray, 2016).

Sexual problems in men are linked to sexual crimes against their female partner, but also to gender-based death (Dobash & Dobash, 2016).

In addition, the state of pregnancy in the intimate partner, combined with the aggressor's previous behavior pattern characterized by drug abuse, violent, control and jealous acts, kill threats to the victim and violent acts against other people, are risk factors of gender-based death as well (Decker, Martin & Moracco, 2004). The violent behaviors against people outside their family nucleus are not associated with the risk of homicide according to some studies (Soares & Abrunhosa, 2016).

B. Risk factors of the victim

As commented before, age difference between the man and the woman in a relationship is associated with the risk of gender-based death, being frequent that aggressors are older than victims, so one characteristic of the victim that represents a risk factor is being younger than the offender (Sebire, 2017; Soares & Abrunhosa, 2016). Nevertheless, the presence of this single risk factor is not enough to predict the homicide, but it is in combination with other risk factors such as being immigrant (Belfrage & Rying, 2004) and the consumption of alcohol and drugs by both the aggressor and the victim simultaneously (Sebire, 2017; Vatnar, Fristad & Bjørkly, 2019).

The increase of the severity and frequency of violence against the victim, accompanied of multiple injuries and an intense unsafe feeling that gets her to consider that their partner would be capable of killing her, as well as close people perceiving the victim alarmed by the violent situation, are risk factors of homicide, particularly for the following near days (Johnson et al, 2020; Nicolaidis et al, 2003; Vatnar & Bjørkly, 2013). The risk increases when the injuries suffered by victims are on her face, head or neck (Reckdenwald et al, 2019). However, the absence of people's perception people of fear and alarm in the victim does not mean that risk of homicide by gender-based violence is lower, given that the victim could be isolated, which is a strong risk factor too (Nicolaidis et al, 2003). The isolation and employment status of victims are linked, due to the fact that the victims who haven't got a job or have been retired and now are

housewives commonly are isolated and consequently have more risk of being killed by their partners (Sebire, 2017).

Women who are submissive to men's demands, lost their choice of freedom as the aggressors took control of their life, have more probability of being killed by their partners (Monckton, 2019). The loss of control even in the own partner's relationship –in instance, the aggressor decides when they have sex, which leads to sexual offenses– is another risk factor of homicide (Bagwell-Gray, 2016). However, the contradiction of the victim to the imposed submissive demands by separation desires and the communication to the aggressor in order to end with the maltreatment are strong risk factors of homicide against women by their partners, reaching the greatest risk on the following days of the notice communication (Monckton, 2019; Nicolaidis et al, 2003).

C. Risk factors of the relationship between the aggressor and the victim

The most important risk factor of gender-based death is a partnership characterized by repeated violence from the aggressor to the victim (Bagwell-Gray, 2016; Cunha & Gonçalves, 2016; Dobash & Dobash, 2011; Johnson et al, 2020; Monckton, 2019; Kivivuori & Lethi, 2012; Vatnar & Bjørkly, 2013), increasing the risk of homicide when its frequency and severity rise with time (Nicolaidis et al, 2003; Soares & Abrunhosa, 2016). This aggravation of the violence against women is commonly associated with sexual violence, so this kind of violence is an indicator of the seriousness of their partner's violence, which could result in death (Bagwell-Gray, 2016; Dobash & Dobash, 2016). However, recent studies add that this escalation of violence is associated to a variety of violence such as physical and psychological violence, that is to say, not only to sexual violence (Johnson et al, 2020; Monckston, 2019; Nicolaidis et al, 2016). Furthermore, early violence in the partner's relationship is a predictor of the persistent and severe violence from the aggressor to the

victim in the future and simultaneously of homicide (Dobash & Dobash, 2011).

Of all typologies of violence, those which cause injuries that need medical assistance are a strong predictor of gender-based death (Bagwell-Gray, 2016; Cunha & Concalves, 2016), particularly injuries from violent acts of strangulation, that increase seven times the risk of a lethal result (Bagwell-Gray, 2016). The violent offenses are not the only risk factors of homicide, injuries and death threats are too (Aguilar, 2019; Belfrage & Ying, 2004; Johnson et al; 2020; Nicolaidis, Curry, Ulrich, Sharps, McFarlane, Campbell, Gary, Laughon, Glass & Campbell, 2003; Soares & Abrunhosa, 2016) especially if they are accompanied by the use of weapons (Bagwell-Gray, 2016; Cunha & Concalves, 2020; Nicolaidis et al, 2003; Vatnar & Bjørkly, 2013). The escalation of violence with injuries and threats in combination are potential indicators for a near future homicide result (Monckton, 2019).

Victims who are cohabiting with the aggressor at the same home suffer with more frequency violent acts, injuries and threats, so they have a higher likelihood of being a victim of gender-based death (Dobash & Dobash, 2016; Sebire, 2017), mainly if the couple were together for over 3 years and below 10 years (Sebire, 2017). These victims who are married with the aggressor are more prone to be killed by gender-based violence (Sebire, 2017; Soares & Abrunhosa, 2016), although girlfriends and boyfriends who have a serious partnership without marital status, but are living together, have similar risk of gender-based death (Dobash & Dobash, 2016). Moreover, in such intimate partners, the presence of stepchildren who are not biological offspring of the aggressor increases more the probability of homicide against women (Sebire, 2017; Soria-Verde et al, 2019).

Divorce in marital couples or separation in girl/boyfriend relationships, followed by perceptions of abandonment by the men who do not want to end the partnership, is another risk factor to gender-based

death (Abrunhosa et al 2020; Aguilar, 2019; Belfrage & Rying, 2004; Cunha & Gonçalves, 2016; Dobash & Dobash, 2011; Fernández & Echeburúa, 2005). It is important to point out that the victim's warning of divorce or separation intentions to the aggressor and the efforts acts to leave the relationship are also risk factors, even if it is not finally produced (Dobash & Dobash, 2016; Monckton 2019). In addition, the risk of homicide increases considerably when the victim is pregnant and the divorce or separation happens during the pregnancy period, especially if the woman experiences a quick escalation of violence as early as the aggressor knows about the pregnancy (Decker et al, 2004).

Stalking behavior is another strong risk factor for the gender-based death (Aguilar, 2019; Johnson et al 2020; Nicolaidis et al, 2003), being it frequent in aggressors who have divorced or separated recently (McFarlane, Campbell, Wilt, Sachs, Ulrich & Xiao, 1999). The most common stalking behaviors which increase the probability of homicide are being followed or spied, repeated phone calls and being waited outside her house or workplace by the aggressor (Cunha & Gonçalves, 2016; McFarlane et al, 1999; Johnson et al 2020). Besides, victims who have suffered physical abuse during the partnership are more likely to be stalked and, subsequently, murdered (McFarlane et al, 1999; Monckton, 2019). As a consequence, the probability of a homicide result is significantly higher when separation or divorce is followed by stalking behavior and prior violence (McFarlane et al, 1999).

The broken partnership is not the only problem in the relationship between the aggressor and the victim which increases the probability of gender-based death; couple's conflicts are also a risk factor of it (Dobash & Dobash, 2011; Sheedan et al, 2015; Soria-Verde et al, 2019). Many of these conflicts are caused by the opposition of the victim to the extreme subordinate relationship of the aggressor, which is characterized by an excessive power, control and possessiveness over her (Aguilar, 2019; Dobash & Dobash, 2011; Monckton, 2019; Nicolaidis et al, 2003; Bagwell-Gray, 2016). The victim's decisions and activities are controlled by the

aggressor with coercive control discourses in order to apart the victim from her family and friends, acquiring the aggressor more control over her (Decker et al, 2004; Johnson et al, 2020; Monckton, 2019). These conflicts result in homicide within the moment of an ongoing conflict just as the aggressor perceives a loss of control over the victim and reacts impulsively (Dobash & Dobash, 2016).

D. Risk factors of the environment

Although there are a slight number of studies focused on the environmental risk factors of homicide against women in a relationship, a significant association between the place and the risk of homicide has been found (Belfrage & Rying, 2004; Reckdenwald et al 2018; Soria-Verde et al, 2019). In particular, women from rural areas have higher risk of suffering severe violence and being murdered by their intimate partners than women from urban areas (Reckdenwald, Szalewski & Yohros, 2018). Moreover, the stay of a woman and a man inside a building alone, in comparison with outdoor places, increases the risk of homicide, being it higher when both are in a house (Belfrage & Rying, 2004; Soria-Verde et al, 2019).

In addition, the geographical distance of the victim and their family members and close friends also matters on the risk of homicide. Victims who have been isolated by their aggressor, by taking her to reside far from the homes of their family and friends, especially have a higher risk of homicide (Nicolaidis et al, 2003). Furthermore, in cases where the aggressor's friends are aware of the maltreatment and isolation that the victim suffers and do not take action to report promote the homicide result (Monckton, 2019).

3.3.3.2. Protective factors of gender-based deaths

In accordance with the scientific studies included in the systematic review, there are only a few personal characteristics of the aggressor, the couple's

relationship and the environment which act as protective factors of homicide against women in a partnership. Protective factors in the victims have not been identified. In relation to the personal features of the aggressor, the non-single marital status, having been a victim or witness of family violence in his childhood and having violated past conditional release or community supervision reduces the likelihood of homicide (Soares & Abrunhosa, 2016). With regard to the partnership, the preservation of the couple's relationship during the victim's pregnancy without ruptures damper the high risk of homicide associated with this situation, decreasing consequently the probabilities of a lethal result (Decker et al, 2004). Moreover, the presence of arguments and disputes in the couple without violence is also a protective factor of homicide against the women (Aguilar, 2019). In respect with the environment, the residence of the couple in an urban area reduces the probability of homicide result (Reckdenwald, 2019).

3.4. Discussion

The systematic review conducted provides updated information on risk and protective factors for gender-based deaths. It validates most results of the unique systematic review carried out by Contreras (2014). Furthermore, it reveals new factors that are not known so far.

Regarding the risk factors of the aggressor, study 1 identifies as risk factors being immigrant, having a history of violence, unemployment and owning weapons (Abrunhosa et al, 2020; Aguilar, 2019; Belfrage &Rying, 2004; Cunha & Conçalves, 2016; Dobash & Dobash, 2011; Fernández & Echeburúa, 2005; Monckton, 2019; Sebire, 2017; Ward-Lasher et al, 2020). These are identified also by the systematic review of Contreras (2014), so the results validate these risk factors. In addition, study 1 provides more detailed information on some risk factors. For example, relating to jobs, the systematic review of Contreras (2014) identified unemployment as a risk factor of gender-based deaths. However, study 1 found that the lack of job, in general, is the risk factor due to retirement and becoming homemaker increasing also the probability of gender-based deaths (Sevire, 2017; Kivivuori & Lethi, 2012; Ward-Lasher, Messing, Cimino & Campbell, 2020). Concerning weapons, the systematic review of Contreras

(2014) found that having them is a risk factor or gender-based death. Study 1 found that owning weapons is not the only risk factor, since the access, purchase and common use of them are also risk factors (Aguilar, 2019; Abrunhosa et al, 2020; Cunha & Conçalves, 2016; Johnson et al, 2020; Monckton, 2019; Reckdenwald et al, 2016).

The new risk factors identified in study 1 in contrast with the systematic review of Contreras (2014) are having elementary education, a low-medium socio-economic status, an arrest history, a protection order or prison convection, having been abused in childhood, school problems, having distorted cognitions, being jealous, having lack of empathy and remorse, having behavioral problems and having sexual problems (Cunha & Conçalves, 2016; Fernández & Echeburúa, 2005). Moreover, the new data of study 1 contributes to resolve controversies of some factors identified in that systematic review. In particular, study 1 identified psychiatric diagnoses of affective disorder, psychotic disorder and personality disorders, and substance abuse or dependence as risk factors. Nevertheless, it has not been made clear in the systematic review of Contreras (2014) (Belfrage & Rying, 2004; Dobash & Dobash, 2016; Johnson, Cusano, Nikolova, Steiner & Postums, 2020; Kikivuori & Lethi, 2012; Soares & Abrunhosa, 2016).

Concerning the risk factor of the victim, study 1 identifies as risk factor being immigrant (Belfrage & Rying, 2004). It is also detected in the systematic review of Contreras (2014), so study 1 validates this risk factor. Furthermore, study 1 provides clarity to the contradictory evidence of pregnancy as a risk factor identified in the systematic review of Contreras (2014). In particular, study 1 found that pregnancy is a risk factor when the aggressor has a substance abuse, is violent, shows control and jealousy acts, threatens the victim, and/or there is a divorce (Decker et al, 2004). However, there are risk factors identified by the systematic review of Contreras (2004) that have not been found in study 1. These are vulnerability by illness or dependence to the aggressor and justifications of the violence.

Respecting the risk factors of partner's relationship, study 1 identifies as risk factors cohabitation, rupture, previous violence from man to the woman, stalking, sexual aggression, and threats (Abrunhosa et al 2020; Aguilar, 2019; Belfrage & Ying, 2004; Bagwell-Gray, 2016; Cunha & Gonçalves, 2016; Dobash & Dobash, 2011; Fernández & Echeburúa, 2005; Johnson et al, 2020; Monckton, 2019; Nicolaidis et al, 2003; Sebire, 2017; Soares & Abrunhosa, 2016; Kivivuori & Lethi, 2012; Vatnar & Bjørkly, 2013). They are identified also by the systematic review of Contreras (2014), so these results validate such risk factors. What is more, study 1 provides more detailed information of the rupture risk factor. In particular, study 1 found that the victim's warning of her desire of rupture to the aggressor, even if it is not produced, is also a risk factor (Dobash & Dobash, 2016; Monckton 2019). Additionally, study 1 identified as new risk factors the high frequency and severity of violence, serious partnership, and stepchildren (Abrunhosa, 2016; Dobash & Dobash, 2016; Nicolaidis et al, 2003; Sebire, 2017; Soria-Verde et al, 2019).

Corresponding to the risk factors of the environment, there are not concordance of the results of Contreras (2014) and study 1. The systematic review of Contreras (2014) identified as risk factors the escape of the aggressor from detection and non-compliance of proximity orders to victim, which rise the probability of gender-based homicide occurring. Study 1 identifies as risk factors living in rural areas, being alone inside a building, being far from family and friends (Belfrage & Rying, 2004; Nicolaidis et al, 2003; Reckdenwald et al 2018; Soria-Verde et al, 2019).

Concerning protective factors, the systematic review of Contreras (2014) had not identified factors that reduced the probability of gender-based deaths. Study 1 contributes to this area of knowledge. In this regard, Cunha & Gonçalves (2016) aim that the knowledge of these factors for gender-based deaths has important implications concerning to their prediction and prevention. Addressing risk factors is essential to reduce the probability of death, but enhancing those factors that reduce the probability of death is equally important. Cunha & Gonçalves (2016) point that knowing these risk factors permit the design and the

development of specific prevention interventions adapted to aggressors' weaknesses and strengths.

Regarding the above, Ward-Lasher et al (2020) indicates that if having been arrested is a risk factor of gender-based deaths, this will be useful information for making decision criteria regarding arrest by the police. Thus, police could arrest depending on the level of risk of each aggressor of gender-based violence. In addition, Reckdenwald et al (2019) states that knowing the risk of homicide is higher in rural areas, the prevention strategies to the population are most necessary in these places. Moreover, trained professionals of local services about risk factors from these areas are needed to detect and assist women with a risk of homicide. In this way, prevention strategies are necessary not only to individuals, but also to communities.

CHAPTER 4. STUDY 2: QUANTITATIVE ANALYSIS

4.1. Importance of the study

Many researchers consider that the study of factors associated with gender-based deaths is still scarce (Contreras, 2014; López-Ossorio, Carbajosa, Cerezo-Domínguez, González-Álvarez, Loinaz & Muñoz-Vicente, 2018). They indicate that despite the factors known so far have been essential to identify and prevent deaths, there are some cases where they couldn't be averted (Elisha, Idisis, Timor & Addad, 2010; Nicolaidis, Curry, Ulrich, Sharps, McFarlane, Campbell, Gary, Laughon, Glass & Campell, 2003). In particular, there are cases of deaths that do not meet the specific factors found by the current scientific literature, having some of them been reported and assessed with not appreciation or as low risk of serious violence (Dobash, Dobash & Cavanagh, 2009; Dutton & Kerry, 1999; Santos & González, 2017). In this regard, scientists point out that there are several cases of gender-based deaths that present different factors from those known for the moment and, therefore, from those included in risk assessment instruments (Contreras, 2014; López-Ossorio et al, 2018). This is a great problem because it complicates the correct prediction of gender-based deaths and, consequently, makes prevention difficult (López-Ossorio et al, 2018). For this reason, scientists from the area show that there is great need for further research on this matter (Contreras, 2014; López-Ossorio et al, 2018).

Concerning the systematic review developed previously, it reveals that legal factors have not been paid attention to. Further investigation of criminal records as well as other legal elements could help predict some deaths, especially in those cases that had been reported before the murder. Environmental characteristics have been also poorly studied in relation to gender-based deaths, being necessary an extensive study of them as well. Moreover, violence and rupture are considered by the systematic review risk factors, but there is not enough elaborated research on these. A study focused on the factors that have not been researched before is the object of the present study.

In this study was used innovative methods from technology and data science not applied for the moment in the gender-based death's research. Supervised learning, as a category of artificial intelligence and machine learning, is used to apply techniques and algorithms that detect the factors associated to deaths and predict them based on automatic learning. It permits automatic detection of patterns on the data in order to find association of the variables with the predicted variable and build with it predictive models. In this way, they make possible to obtain findings that classical statistic cannot reach.

4.2. Method

4.2.1. Participants

The present study is based on secondary data from Vlex legal database. The data extracted belong to cases of gender-based violence. The search of these cases was conducted on March 26th 2021 with crime, judicial resolution, jurisdiction, jurisdictional organ, time, and place search criteria.

Regarding crime, there were introduced in Vlex the keyword 'gender-based violence' in Spanish ('violencia de género') and the specific penal typologies that are included in this offense were introduced in Vlex adding the articles of Spanish Penal Code 138, 139, 140, 147, 148, 149, 150, 153, 163, 164, 166, 169, 172, 173, 178, 179, 180, 181, 187, 197, 208 and 209. These articles include the crimes of homicide, murder, injuries, illegal detention, threats, sexual aggression and abuse, prostitution and sexual exploitation, unauthorized access to privacy, and injuries applicable to gender-based violence. Therefore, crimes that are not gender-based violence were excluded (Gómez, Nieto, Pérez, Cortés & Núñez, 2018; Ley Orgánica 10/1995, de 23 de noviembre, del Código Penal).

Concerning judicial resolutions, data was reduced to sentences. This is why judicial resolutions that decide about the issue of the cases and terminate the proceedings are needed, excluding the provisional resolutions. The jurisdiction was restricted to penal field because it is related to crimes. As a result, civil, fiscal, social, constitutional, commercial and business, public and

administrative, and procedural law fields were excluded (Gutiérrez, 2018; Ley Orgánica 6/1985, 1 de junio, del Poder Judicial; Ley 1/200, de 7 de enero, de Enjuiciamiento Civil; Martín, 2020).

The jurisdictional organ was limited to provincial and supreme courts. Instruction courts and specialized courts of violence against women are competent for diligence labors and prosecution of minor offences. Penal courts prosecute crimes with prison punishment up to 5 years. The mentioned courts were excluded due to the medium and severe crimes of gender-based violence not being included. Supreme courts prosecute all gender-based violence that has been interposed through law resources, delivering new sentences of sentences previously imposed by other judicial organs so they mostly have the final decision in these cases. The selection of its court provides to the study a diversity of type and severity of gender-based violence crime. Moreover, the provincial courts were also selected for the same reason, being them competent for prosecuting crimes with prison punishment above 5 years and other gender-based violence cases that have been interposed through law resources, some of them not going to the high court such as the supreme courts. (Gutiérrez, 2018; Ley Orgánica 6/1985, 1 de junio, del Poder Judicial; Martín, 2020).

Respecting the place, the selected cases were from Spain and not from other countries due to legal resolutions of the gender-based violence being different in each nations. Concerning time, chosen cases were limited from July 2019 to October 2020 in order to obtain recent data of pre-covid and post-covid periods. Taking into count the two periods, it is necessary to understand the possible differences of gender-based violence before and after the new pandemic reality.

Applying the search criteria, the initial 171,100 results of gender-based violence were reduced to 552 cases. Subsequently, the proven facts and the judgment part of each one were read, excluding the acquittals sentences, condemnatory sentences of adult aggressors with minor victims, condemnatory sentences of reciprocal violence between men and women, sentences which annul the previous judicial decision of recourse and ordering the continuation of

proceedings by the competent judicial organ, sentences that do not present proven facts to refer the previous sentence of judicial recourse, and sentences written in co-official languages from Spain.

As the result, 267 Spanish cases qualified as gender-based violence in penal sentences promulgated by Spanish provincial and supreme courts were selected for the present study. The study is composed by 217 cases of not lethal violence against women, being crimes against physical and psychological integrity, personal freedom, sexual integrity and privacy perpetrated by a husband, ex-husband, partner of ex-partner of women. The other 50 cases are lethal gender-based lethal offense, being it crimes against life integrated by homicides and murders.

4.2.2. Procedure

Firstly, the study variables were defined and collected in a dataset. The information of the 267 cases of lethal and non-lethal violence against women previously mentioned were registered by the study variables of the dataset. Once it was done, the data was cleaned to verify that the study variables had values within the established range. They were also checked to have logical compatibilities with other variables values, and have complete information. In accordance with this, variables with missing values were removed.

Secondly, the number of lethal and non-lethal violence against the women is not equal. This is a problem for the algorithms used afterwards, causing wrong results biased for the majority group of cases (Barandela, Valdovinos, Sánchez & Ferri, 2004; Sun, Wong & Kamel, 2009). To deal with it, a resampling was carried out. This ensures that the results obtained in the study are robust. Specifically, a hold-out method to divide the cases of dataset into two sets (Awwalu & Nonyelum, 2019) was used. The first set contains 70% of all cases and it is used to train a classification model (that will be built later). The second set is formed by the remaining 30% of cases which will used to test said model. Moreover, two re-size techniques were used: over-sampling and under-sampling of the training set. The over-sampling increases the number of the minority

group/class (deaths) to size it with the majority group/class (non-deaths). The under-sampling decreases the majority group/class (non-deaths) to balance it with the minority group/class (deaths) (Blagus & Lusa, 2015; Japkowicz & Stephen, 2002). A hold-out was repeated 100 times with the generation of 100 random datasets with different training and test sets, 50 for over-sampling and 50 for under-sampling. This was done randomizing the seed of the set partitioner (Elsner, 2005).

Third, deaths vs. non-deaths classification models were used. These models include:

- BayesNet and NaiveBayes combine the Bayes theorem with decision rule presenting estimations of the probability of occurrence of the class (dependent variable) based on a set of features (independent variables) being in the network. It is built with cases of the training set. The number of parents of the BayesNet were modified to find the optimal network (Friedman, Geiger & Goldszmidt, 1997).

- MultilayerPerceptron is an artificial neural network that uses backpropagation to learn with the data introduced by weights for building a classification model that predicts the dependent variable. The number of layers and neurons of this neural network is modified to improve the classification model (Jabez, Gowri, Vigneshwari, Mayan & Srinivasulu, 2019).

- J48, RandomTree and RandomForests are decision trees that predict the dependent variable depending on the distribution of independent variables over the flow-chart in a tree structure. They were built with training data as well. The main difference between J48 and RandomTree is that the latter generates the tree with the instances randomly parsed. RandomForest is a result of a combination of a great number of RandomTrees (Ali, Khan, Ahmad & Maqsood, 2012).

Fourth, after obtaining the results of the 100 databases with each algorithm, the mean and standard deviation of each algorithm were calculated. Subsequently, the algorithms with the best results were analyzed and selected. Later, the databases that had better results on the algorithms previously selected were also analyzed and chosen.

Fifth, a feature selection study was carried out using the search method of Fast Correlation Based Filter (FCBF). It identifies and quantifies the symmetrical uncertainty of each independent variable with the dependent variable, but also between the independent variables. The symmetrical uncertainty is a measure of non-linear correlation. It provides a list of relevant and redundant variables, corresponding the relevant variables to independent variables that are highly correlated with the dependent variable or class while having low inter-correlation between them. The redundant variables refer to independent variables that have higher correlation with the relevant variables than with the dependent variable. FCBF provides information of the correlation of independent variables with the dependent variable, but also of independent variables that are redundant with other independent variables that are relevant (Liu, 2003). Furthermore, a linear correlation was also carried out using the Ranker search method. It quantifies the contribution of each independent variable to the dependent variable, considering the gain of information of each independent variable one to it (Dinakaran & Ranjit, 2013). This made possible to compare both FCBF and the Ranker.

The data provided by FCBF allows an optimal reduction of the data, removing irrelevant or redundant variables and uncorrelated variables of the analysis. The present study applied this feature selection based on FCBF criteria, and compared it with the complete dataset classification to examine the contribution of redundant variables on the dependent variable (Dinakaran & Ranjit, 2013). Dataset samples with both relevant and redundant variables simultaneously were prepared for classification. A dataset with only relevant variables was also used.

Sixth, after the FCBF and Ranker were applied to the selected datasets, the relevant and redundant variables of each one were compared. Later, the

datasets with the best results in J48 were selected to compare their graphs and obtain information about the combination of variables that are related with the lethal and no lethal results.

4.2.3. Measures and instruments

There are several variables in the present study. Regarding previous legal data, there are general criminal records and criminal records of gender-based violence variables. The first variable mentioned includes all penal backgrounds except gender-based violence crimes which is included in the second. Moreover, there are specific variables which complete the information of the criminal records of gender-based violence variable, concretely 5. These variables are criminal records of injuries for gender-based violence, criminal records of threats for gender-based violence, criminal records of constraints for gender-based violence, criminal records of habitual violence for gender-based violence, and criminal records of insults for gender-based violence. Criminal records of illegal detention for gender-based violence, criminal records of sexual aggression for gender-based violence, criminal records of sexual abuse for gender-based violence, criminal records against personal offense for gender-based violence were also initial variables of the study, but they were removed due to there lack of data in them.

There are also variables of the type and duration of sentence by the criminal records of gender-based violence. Respecting the kind of sentence, there are custodial sentence and non-custodial sentence variables. Besides, there are complementary variables, which are prison sentence, deprivation of the right to possess and carry weapons sentence, prohibition of approximation to the victim sentence, prohibition of communication with the victim sentence, community service sentence, and fine sentence. Initially, other specific custodial and non-custodial variables as permanent localization sentence, disqualification sentence, deprivation of the right to drive motor vehicles and motorcycles sentence, deprivation of the right to reside in or go to concrete places were included. However, these variables were finally excluded from the analysis due to the absence of data. Concerning the duration of sentence, there are the

variables of time prison sentence, time deprivation of the right to possess and carrying of weapons sentence, time prohibition of approximation to the victim sentence, time prohibition of communication with the victim sentence, time community service sentence, and time fine sentence. These variables are numerical. It must be pointed out that initially the time of permanent localization sentence, disqualification sentence, deprivation of the right to drive motor vehicles and motorcycles sentence, deprivation of the right to reside in or go to concrete places were also included. However, these variables were finally excluded because of the absence of data.

Regarding actual legal data, there are variables which have information of the gender-based violence crimes by an actual judicial resolution. These variables are crime of injuries for gender-based violence, crime of illegal detention for gender-based violence, crime of threats for gender-based violence, crime of constraints for gender-based violence, crime of habitual violence for gender-based violence, crime of sexual aggression for gender-based violence, crime of sexual abuse for gender-based violence, crime against personal offense for gender-based violence crime of insults for gender-based violence, crime of homicide for gender-based violence, and crime of murder for gender-based violence. The last two variables were unified in another variable named deaths. Furthermore, in the study the variable protection measures present at the moment of the mentioned crimes was included.

Corresponding to violent act, there were initially variables of time of violence appears, frequency of violence, severity of violence, increase of frequency and severity of violence with time, physical violence, psychological violence. Nevertheless, these variables were removed due to missing values except for two variables which are frequency and severity of violence. Moreover, originally the actions of the victim to the violence by the victim's coping strategies variable was also evaluated, but it was removed due to missing values.

Regarding the breakdown of the relationship, the variables rupture, rupture acceptance by aggressor, time between rupture and crime, victim´s new partner,

and resume partnership were used. Only the rupture variable is analyzed in the present study, since the rest have been removed for missing values.

Concerning to environment and situation of crime, there are the variables place of crime, time of crime, situational characteristics of crime, social control, instruments of crime, and discussion. Nevertheless, they are not either analyzed in the present study due to the high presence of missing value, so they are removed. The same happen with personal characteristics of victims and aggressors variables as age, nationality, marital status, and mental health.

In the present study, death is the dependent variable, whereas the rest mentioned are the independent variables.

4.2.4. Data analysis

The software Knime version 4.3.0 (Berthold, Cebron, Dill, Gabriel, kötter, Meinl, Ohl, Thiel & Wiswedel, 2009) was used for data pre-processing, specifically to carry out the hold-out, oversampling and under-sampling. The software Weka version 3.8.5 (Hall, Frank, Holmes, Ptahringer, Reutemann & Witten, 2008) was used for data analysis, specifying in it the numeric and categorical variables of the dataset. Weka was used for the correlation study with FCBF and Ranker, and the classification algorithms BayesNet, NaiveBayes, MultilayerPerceptron, J48, RandomTree and RandomForest.

4.3. Results

4.3.1. Results of balanced over-sampling of minority class

The mean and standard deviation of each result of the 50 subsets of balanced over-sampling of deaths on BayesNet, NaiveBayes, MultilayerPerceptron, J48, RandomTree and RandomForest is shown in Table 3. The mean and standard deviations are those of the True Positive Rate (TPR) and True Negative Rate (TNR). The first refers to the proportion of non-lethal gender-

based violence cases correctly classified whereas the second alludes to the proportion of gender-based homicide cases classified correctly.

BayesNet with 1 parent per variable, BayesNet with 5 parents, MultilayerPerceptron with 3 layers of 20 neurons each, and J48, have the best results in TNR. Therefore, they are more effective at predicting gender-based deaths than the other algorithms. This is due to the TNR with the 50 subsets presents around 40-60% accuracy of gender-based homicides, considering the mean and standard deviation. Furthermore, these algorithms reveal good TPR, being the non-lethal gender-based violence identified correctly in 73-85% of the cases approximately.

Fast Correlation Based Filter (FCBF) using the subsets with the best TNR mean and standard deviation results in BayesNet with 1 parent, BayesNet with 5 parents, MultilayerPerceptron with 3 layers of 20 neurons each one, and J48 algorithms reveal common relevant and redundant variables. Specifically, the subsets used for FCBF have 0,73 and 0,80 TNR in the mentioned algorithms, having all of them in common as relevant variables the severity of violence, frequency of violence, and crime of illegal detention for gender-based violence. The majority of them have in common as relevant variables crime of injuries for gender-based violence and crime of sexual aggression for gender-based violence. In this way, they rest of variables are redundant as can be seen in the Table 4.

The variables of time prison sentence, time deprivation of the right to possess and carry weapons sentence, time prohibition of approximation the victim sentence, time prohibition of communication with the victim sentence, time community service sentence, and time fine sentence are not associated with crime since they do not present symmetrical uncertainty by FCBF nor correlation by Ranker.

Table 3. Mean and standard deviation results of TPR and TNR from over-sampling subsets.

	BayesNet					NaivesBayes	MultilayerPerceptron					J48	RandomTree	RandomForest
	1 parent	5 parents	8 parents	12 parents	15 parents		1 layer with 43 neurons	1 layer with 50 neurons	1 layer with 60 neurons	2 layers with 20 neurons each one	3 layers with 20 neurons each one			
TPR	0,772 ± 0,057	0,820 ± 0,052	0,820 ± 0,061	0,820 ± 0,061	0,820 ± 0,061	0,696 ± 0,299	0,812 ± 0,058	0,821 ± 0,048	0,813 ± 0,056	0,790 ± 0,072	0,768 ± 0,057	0,779 ± 0,059	0,829 ± 0,053	0,867 ± 0,047
TNR	0,524 ± 0,103	0,488 ± 0,117	0,467 ± 0,118	0,459 ± 0,121	0,458 ± 0,121	0,395 ± 0,338	0,444 ± 0,107	0,444 ± 0,107	0,439 ± 0,105	0,477 ± 0,128	0,492 ± 0,110	0,500 ± 0,122	0,436 ± 0,106	0,468 ± 0,105

Table 4. FCBF results from over-sampling subsets.

Relevant variables	Redundant variables
- Severity of violence.	- General criminal records.
- Frequency of violence.	- Criminal records of gender-based violence.
- Crime of illegal detention for gender-based violence.	- Criminal records of injuries for gender-based violence.
	- Criminal records of threats for gender-based violence
	- Criminal records of constraints for gender-based violence.
	- Criminal records of habitual violence for gender-based violence.
	- Criminal records of insults for gender-based violence.
	- Custodial sentence.
	- Non-custodial sentence.
	- Prison sentence.

- Deprivation of the right to possess and carrying of weapons sentence.
- Prohibition of approximation the victim sentence
- Prohibition of communication with the victim sentence
- Community service sentence.
- Fine sentence, crime of threats for gender-based violence.
- Crime of constraints for gender-based violence.
- Crime of habitual violence for gender-based violence.
- Crime of sexual abuse for gender-based violence.
- Crime against personal offense for gender-based violence.
- Crime of insults for gender-based violence.
- Rupture.

Table 5. Mean and standard deviation results of TPR and TNR from under-sampling subsets.

	BayesNet					NaivesBayes	MultilayerPerceptron					J48	RandomTree	RandomForest
	1 parent	5 parents	8 parents	12 parents	15 parents		1 layer with 43 neurons	1 layer with 50 neurons	1 layer with 60 neurons	2 layers with 20 neurons each one	3 layers with 20 neurons each one			
TPR	0,552 ± 0,167	0,620 ± 0,099	0,620 ± 0,109	0,620 ± 0,109	0,620 ± 0,109	0,740 ± 0,260	0,616 ± 0,073	0,628 ± 0,071	0,618 ± 0,076	0,611 ± 0,113	0,607 ± 0,161	0,729 ± 0,123	0,642 ± 0,081	0,633 ± 0,067
TNR	0,544 ± 0,148	0,555 ± 0,105	0,549 ± 0,111	0,549 ± 0,111	0,549 ± 0,111	0,344 ± 0,310	0,600 ± 0,116	0,593 ± 0,114	0,609 ± 0,125	0,605 ± 0,130	0,632 ± 0,145	0,564 ± 0,120	0,580 ± 0,119	0,593 ± 0,110

Focusing on the visual graphs from of J48 of subsets with high TNR (Appendix 3), they have similar structures with the relevant variables identified previously. In particular, the variable severity of violence appears in the top and medium zones of the graph, whereas the variable frequency of violence appears in the medium and low zones of the graph. This data indicates that the severity of violence is fundamental to predict roughly deaths, being the frequency of violence essential to predict it more precisely. Moreover, they are repeated many times in the graph. They also combine with other study variables, being present in the majority of death cases. However, severity of violence is a variable taken into count to predict violence, but not always the frequency, although it is in most cases. Data reveals that these variables are decisive to predict the deaths, but frequency of violence is not always substantial.

Concerning the relevant variables crime of illegal detention for gender-based violence, crime of insults for gender-based violence and crime of sexual aggression for gender-based violence, their presence in the graph is lower. Specifically, crime of illegal detention for gender-based violence appears only once, although it is at the top. It indicates that it is decisive to predict deaths in some cases and in them this variable is fundamental. Crime of sexual aggression for gender-based violence has also low presence with a mean of 1 and 2 apparitions, but it is decisive to the prediction of deaths to be situated in the medium zones of the graph. Crime of insults for gender-based violence presents a mean of 2 - 3 apparitions, being them in the medium and low zones of the graph. It is relevant to more precise predictions in combination with other variables. Furthermore, there are some redundant variables common to all subsets, such as crime of threats for gender-based violence and crime of constraints for gender-based violence which appear at the end of the graph, so they are fundamental to make precise predictions.

Additionally, J48 graphs coincide that certain combinations of variables lead to deaths:

- First, presence of severe violence, absence of crime of illegal detention for gender-based violence, absence of crime of injuries for gender-based violence, and absence of crime of threats for gender-based violence.

- Second, presence of severe violence, absence of crime of illegal detention for gender-based violence, presence of crime of injuries for gender-based violence, and presence of crime of sexual abuse for gender-based violence.

- Third, presence of severe violence, absence of crime of illegal detention for gender-based violence, presence of crime of injuries for gender-based violence, absence of crime of sexual abuse for gender-based violence, presence of rupture and medium or low frequency of violence.

- Fourth, presence of severe violence, absence of crime of illegal detention for gender-based violence, presence of crime of injuries for gender-based violence, absence of crime of sexual abuse for gender-based violence, absence of rupture and medium or high frequency of violence.

- Fifth, absence of severe violence, absence of crime of habitual violence for gender-based violence, absence of non-custodial sentence, absence of protection measures, absence of criminal records of gender-based violence, and presence of medium level of severity of violence.

- Sixth, absence of severe violence, absence of crime of habitual violence for gender-based violence, absence of non-custodial sentence, absence of protection measures, absence of criminal records of gender-based violence, presence of medium level of severity violence, presence of criminal records of injuries for gender-based violence, absence of rupture.

- Seventh, absence of severe violence, absence of crime of habitual violence for gender-based violence, absence of non-custodial sentence, absence of protection measures, absence of criminal records of gender-

based violence, presence of medium level of severity violence, absence of criminal records of injuries for gender-based violence, presence of criminal records of threats for gender-based violence, and presence of criminal records of constraints for gender-based violence.

In addition, the subsets coincide also that there are specific collections of variables which do not lead to deaths:

- First, presence of severe violence and presence of crime of illegal detention for gender-based violence.

- Second, presence of severe violence, absence of crime of illegal detention for gender-based violence, absence of crime of injuries for gender-based violence, and presence of crime of threats for gender-based violence.

- Third, presence of severe violence, absence of crime of illegal detention for gender-based violence, presence of crime of injuries for gender-based violence, and presence of crime of sexual abuse for gender-based violence, presence of rupture, and high frequency of violence.

- Fourth, presence of severe violence, absence of crime of illegal detention for gender-based violence, presence of crime of injuries for gender-based violence, and presence of crime of sexual abuse for gender-based violence, absence of rupture, and low frequency of violence.

- Fifth, absence of severe violence and presence of crime of habitual violence for gender-based violence.

- Sixth, absence of severe violence, absence of crime of habitual violence for gender-based violence, absence of non-custodial sentence, absence of protection measures, and presence of criminal records of gender-based violence.

- Seventh, absence of severe violence, absence of crime of habitual violence for gender-based violence, absence of non-custodial sentence, absence of protection measures, absence of criminal records of gender-based violence, absence of crime of injuries for gender-based violence, presence of crime of threats for gender-based violence, and absence of crime of constraints for gender-based violence.

Regarding the FCBF, the removal of redundant variables worsens the results and, for this reason, they were maintained in the model.

4.3.2. Results of balanced under-sampling of majority class

The mean and standard deviation of each result of the 50 subsets of balanced under-sampling of non-deaths on BayesNet, NaiveBayes, MultilayerPerceptron, J48, RandomTree and RandomForest are produced in Table 5. In this case, the mean and standard deviation are of True Positive Rate (TPR) and True Negative Rate (TNR) too.

MultilayerPerceptron with 3 layers of 20 neurons each one, J48, RandomTree and RandomForest have the best results in TNR. In this way, they are more effective to predict gender-based homicides than the other algorithms. They register 46-71% correct of gender-based homicides, considering the mean and standard deviation. Furthermore, it is also observed that these algorithms reveal good TPR, being the non-lethal gender-based violence identify correctly in 55-76% of the cases approximately.

FCBF using the subsets with the best TNR mean and standard deviation results in MultilayerPerceptron with 3 layers of 20 neurons each one, J48, RandomTree and RandomForest manifest common relevant and redundant variables. Specifically, the subsets used for FCBF have 0,80 and 0,86 TNR in the mentioned algorithms, having all of them in common as relevant variables the severity of violence, crime of sexual aggression for gender-based violence, crime against personal offense for gender-based violence, and fine sentence. The majority of them have in common as relevant variables crime of injuries for

gender-based violence and crime of illegal detention for gender-based violence. In this way, they have in common as redundant variables general criminal records, criminal records of gender-based violence, criminal records of injuries for gender-based violence, criminal records of threats for gender-based violence, criminal records of constraints for gender-based violence, criminal records of habitual violence for gender-based violence, and criminal records of insults for gender-based violence, custodial sentence, non-custodial sentence, prison sentence, deprivation of the right to possess and carry weapons sentence, prohibition of approximation the victim sentence, prohibition of communication with the victim sentence, community service sentence, crime of threats for gender-based violence for gender-based violence, crime of constraints for gender-based violence, crime of habitual violence for gender-based violence, crime of sexual abuse for gender-based violence, crime of insults for gender-based violence, rupture, and frequency of violence.

The variables time prison sentence, time deprivation of the right to possess and carrying of weapons sentence, time prohibition of approximation the victim sentence, time prohibition of communication with the victim sentence, time community service sentence, and time fine sentence are not associated with crime since they do not present symmetrical uncertainty by FCBF either correlation by Ranker.

Focusing on the visual graphs results of J48 of subsets with high TNR (Appendix 4), they have low level of similarity in their structures. Of the relevant variables identified before, the severity of violence appears always on the top of the graph. Thus, it is fundamental to predict deaths. It is not repeated many times in the graph, appearing only once. Crime of injuries for gender-based violence appears only once as well, being at top level of the graph too. It is also decisive for the prediction of death in some cases. Particularly, it can be observed that it is only fundamental to predict deaths in cases with presence of severe violence.

Moreover, J48 graphs coincide that concrete combinations of variables do not lead to death. First, absence of severe violence and absence of non-custodial sentence. Second, presence of severe violence and absence of crime of injuries

for gender-based violence. Regarding the combination of variables that leads to death, they can be seen in the J48 graphs as there are common structures for it.

Concerning the FCBF, the removal of redundant variables worsens the results and for this reason there were maintained in the model.

4.4. Discussion

The subsets of over-sampling minority class have higher TPR than the subsets of under-sampling majority class with the different algorithms of BayesNet, NaiveBayes, MultilayerPerceptron, J48, RandomTree and RandomForest. Nevertheless, the subsets of over-sampling minority class have lower TNR than subsets of under-sampling majority class. The differences in TNR are not very large between the over-sampling and under-sampling subsets, but they are in the TPR. It is why in under-sampling subsets an improvement in TNR generates a significant decrease in TPR whereas in the over-sampling subsets the improvement in TNR does not affect so much to TPR. Thus, the reduction of information of non-deaths leads to a worse classification of them, but simultaneously it reduces the noise to classify better the deaths. The problem is that the wrong classification of false deaths is high, not being it effective to identify and manage the risk of deaths. Taking the over-sampling subsets, they classify correctly approximately the same deaths, but classify better the non-deaths, being it a more efficient model.

Notwithstanding the above, both over-sampling and under-sampling subsets have common relevant variables identified by FCBF which is an indicator of validity and reliability to predict deaths. In particular, the common relevant variables are severe violence, crime of illegal detention for gender-based violence, crime of injuries for gender-based violence, and crime of sexual aggression for gender-based violence. Furthermore, there are redundant variables which contribute to the relevant variables, contributing them indirectly to the deaths.

In addition, the groups of over-sampling and under-sampling subsets coincide in that there are certain variables that are not associated with deaths by FCBF and Ranker. They are related with the time of sentence by prior records of gender-based violence, being the time prison sentence, time deprivation of the right to possess and carrying of weapons sentence, time prohibition of approximation the victim sentence, time prohibition of communication with the victim sentence, time community service sentence, and time fine. However, the type of sentences by prior records of gender-based violence is connected with deaths. Thereby, the increase in the duration of sentences in this matter is not a solution to prevent deaths, being more important the type of sentence imposed.

About the variables associated to deaths, these themselves individually do not determine individually whether the case is going to end in death or not, but the combination of a group of variables that enhances the death result or prevent it. For example, the presence of severe violence by itself does not determine the deaths neither the no-deaths. In some cases, the presence of severe violence in combination with the absence of crime of illegal detention for gender-based violence, absence of crime of injuries for gender-based violence and presence of crime of threats for gender-based violence do not lead to death. In other cases, the presence of severe violence with absence of crime of illegal detention for gender-based violence, presence of crime of injuries for gender-based violence, and presence of crime of sexual abuse for gender-based violence leads to death. Hence, more deaths could be detected than at the moment because it faces the real diversity of the deaths which is not exactly the same in all cases, being similar some group of them for meeting a combination of factors. It overcomes the limitations of considering individual factors separately to predict the deaths by the actual scientific studies.

CHAPTER 5. DISCUSSION

The main objective of the present study was to analyze the risk and protective factors associated to gender-based deaths. The specific objectives were two. First, examining the individual factors that increase and decrease the probability of gender-based deaths. Second, analyzing the combination of the individual factors that increase and decrease the probability of gender-based deaths. They have been achieved with the results obtained in the studies 1 and 2.

5.1. Discussion of the objective 1

Individual risk factors of aggressor, victim, partner's relationship and environment of gender-based deaths have been found. Individual protective factors of aggressor, partner's relationship and environment of the same study phenomenon have also been identified. There are psychological, criminological and social theories explanations for the factors' findings.

Regarding attachment theory, several studies reveal that violent men commonly have anxious-insecure attachment and avoidant-insecure attachment patterns (Babcock, Jacobson, Gottman & Yerington, 2000). It could be a consequence of problematic parental attachment in the childhood. The early attachment of men to their parents affects adult relationships, including the romantic relationships (Elisha, Ididis, Timor & Addad, 2010).

On the one hand, the anxious-insecure attachment is developed when parents are inconsistent in the childcare, providing support and affection alternating with rejection and neglect. The children learn that maintaining interpersonal relationships requires great effort, and subsequently they make everything possible for not losing people that they love. Violent men with this type of attachment usually have feelings of hostility and jealousy, using violence to avoid abandonment (Bowlby, 1969; Bowlby, 1979). Some men with this attachment pattern have killed their female partner. Many of them expressed love to their women, using in the moment of the crime incontrollable violence when

learning about their partner leaving (Cohen, 2004; Gosinsky, 2002). It could be an explanation for rupture, stalking and jealousy being risk factors of gender-based death. Additionally, the preservation of the couple's relationship as a protective factor it is also understood by the present theory.

On the other hand, the avoidant-insecure attachment is characterized by a parental neglect to the children. Consequently, these children develop in their adulthood an unappreciated feeling, and to feel better they usually use violence to gain attention, power and control (Bowlby, 1969; Bowlby, 1979). Men with this pattern potentiate their self-imagen through violence against their female partner or wife. This violence can end with the life of the woman (Babcock et al, 2000).

The submissive pattern of the victim could perpetrate the violence of aggressor with these attachments, leading to an escalation of violence, which can end in death. Victims perceive this escalation, feeling afraid of how the violence may end. This could explain why submissive and unsafe feeling are considered risk factors.

Concerning psychopathological theories, homicide and murderer behavior could be influenced by psychological deficiencies. Many men with mental disorders usually have social and interpersonal problems, so they socialize through aggressive means (Elisha et al, 2010). Some of them are aggressors of gender-based violence whose uses of violence led to death. It substantiates the affective, psychotic and personality disorder which increase the probability of gender-based deaths. Also, behavioral problems and school problems risk factors influenced by mental illness. The risk factor of lack of empathy and remorse could be explained by a mental disorder, as indicated in this theory. However, these feelings are not always due to a mental illness.

In addition, men with mental illness usually suffer from substance abuse (drug and alcohol) to cope their difficulties (Russel & Harmes, 2001; Wilson & Daly, 1994). For this reason, mental disorders and substance abuse are commonly linked, and they potentiate the death risk.

Despite the mentioned, there are studies that indicate that it is not clear if the diagnosis of psychopathy and the dependence of alcohol and/or drug abuse are risk factors, existing contradictories results (Contreras, 2014).

Regarding sociofeminist theories, the violence against women is a manifestation of men who continue the patriarchal and machismo ideas (Rusel & Harmes, 2001). They consider the use of violence necessary to domain and control their partners (Polk & Ranson, 1991). Gender-based violence appears when women show opposition to the superiority position of men within the family. In these cases, men try to keep the position even if it ends with the the woman's life (Johnson, 1995; Nicolaidis et al, 2003). This theory substantiates the risk factor of biased cognitions of violence and subordination of men to women.

Corresponding to social learning and intergenerational transmission of violence theories, violent behavior is learnt by socialization and observation (Bandura, 1973). 30 per cent of people who have suffer or have witnessed violence within family in their childhood reproduce the violent pattern (Gondolf, 1999; Kaufman & Zigler, 1987). In these cases, it is common that family members acquire the belief of love and damage are united (Straus, 1976). In this percentage mentioned are included children that in the adulthood are aggressors of violence against women (Johnson & Grant, 1999). Men normalize violence as a form of interaction with family members, not having learned other adaptative ways of relationship (Addad, 1980). The present theory could explain why physical abuse by family in the childhood is a risk factor of gender-based death. Nevertheless, being a victim or witness of family violence in his childhood has been identified as a protective factor by scientific studies; it could represent the rest 70% of cases which do not develop an intergenerational transmission of violence.

The history of violence of the aggressor as a risk factor could be explained also by the mentioned theory. The early appearance of violence against women is an indicator of the normalization of violence against women learned in the childhood. The reason of it being a risk factor could be due to this strong internalization of scheme and patterns of violence from the beginning of the

aggressor's life which is hard to change in the adulthood. Unfortunately, this violence will escalate in frequency and severity until reaching death.

Gender-based violence cases have inherent a cycle of violence composed by three consecutive phases, according to Walker (1979). First, accumulation of tension in which the couple have little conflicts that are not solved in an adequate way and lead to accumulation of tension between them. The gradual intensification of tension leads to a bad partnership characterized by the man's anger. The woman tries to please him in order to reduce the tension and thus have a better partnership. Thus, woman becomes submissive of the aggressor, even without being aware of it. Second, violent explosion in which the man exerts physical and psychological violence on the woman. The man unloads through hostility all tension accumulated in the previous phase over the woman. In this phase, she cannot reduce or stop it with their behavior. Third, honeymoon in which the woman wants to end the partnership, but the man feels remorseful for what happened and reflect to his woman. He promises that it will never happen. If she believes him, the woman minimizes and justifies his violent acts. It leads to a good partnership for a time until the tension builds up again and the cycle starts once more.

The repetition of the mentioned cycle of violence supposes an escalation in the severity of it. As the violence cycle increases, so does the severity of the violence (López,2013; Walker,1979). Therefore, victims of gender-based violence who have been through the cycle several times and have experienced an escalation of violence for it have more probabilities of being assassinated by their partners. However, the repeated number of cycles which leads to the killing is not equal for every woman, existing risk and protective factors that contribute to this diversity (Redondo & Garrido, 2013; Walker,1979). In these cases, identifying these factors are essential to prevent the deathly end.

Violence that causes physical injuries of the victim or psychological suffering by threats, which are identified as risk factors, is a sign of violence escalation. These violent patterns have been identified by some authors as

behavioral problems, which is identified as other risk factor in the scientific literature.

Moreover, the violence against women could led to police and judicial consequences, especially for illegal detention, injuries and sexual crimes. Arrest and protection orders are legal consequences that are identified as risk factors. Specifically, some studies indicate that risk factors are the escape of aggressor of a detection/arrest from institutions and the non-compliance of protection orders to victim (Contreras, 2014). About the violation of a past conditional release or community supervision, some studies identified them as protective factors and others have not found relationship with deaths.

The data reveals the violation by itself is not determinant of a risk or protective factor, but rather the nature or the type of the sentence or the measure violated. Moreover, the time of sentence of prior records are not associated with gender-based deaths, so they are neither risk factors nor protective factors of gender-based deaths. In this way, increasing the length of sentences does not dissuade the aggressor from committing gender-based murder. This idea is supported by scientific evidence which reveals that educational measures united to the sentence are more effective than the years of them (Bruyns & Nieuwenhuizen, 2004). A deep study on the type of sentence which dissuades deaths is required to prevent this crime in the future.

Respecting stress theories, people have stress when they perceive an event as threatening and beyond their resources. In the case of the abused individuals, the response to stressful situations is usually violence which can end in death (Landau & Roelf, 1998; Straus, 1976). In these cases, partner's conflict, unemployment, immigration, and low income have been identified as stressors (Nicolaidis et al, 2003; Wilson & Daly, 1992).

Immigration has been identified as a risk factor, being it a major source of stress. Arriving in a new country involves adapting to a lot of changes such as language, culture, weather, food, housing and so on. Men could respond to this situation with violence against women. If the woman is also immigrant, violence

has less probabilities to stop due to the obstacles to report or seek professional help (Arnoso, Arnoso, Mazkiaran & Irazu, 2012; Nicolaidis et al, 2003; Wilson & Daly, 1992).

Poverty is commonly a source of stress. Thus, the risk factors low-medium socio-economic status, absence of job, and elementary education could be related to it. In particular, the elementary education could impede to obtain a job and, subsequently, earn money, which could reflect on a low-medium socio-economic status. The low financial income generates stress due to the perceived lack of resources to meet payments. This state could be cope by men in a violent way against women.

The age difference between a man and a woman in a partner's relationship has been identified as a risk factor. This could be due to the stress of living two different developmental stages with different points of view and priorities that could generate constant conflicts. However, it is common that in most heterosexual couples the man is older than the woman and most of these couples do not end in gender-based deaths (Agnew & Lehmiller, 2008). Therefore, more investigation about the relationship of age difference of partners and gender-based death would be necessary.

Stepchildren are other stressing element that are considered a risk factor. Evidence reveals that having not biological children generate more stress on the partner. It is a source of conflicts which increases the probabilities of severe violence against women (Brownridge, 2004).

Furthermore, the partner's conflicts are a risk factor of death, which could be produced by the mentioned stress. However, the conflict by itself does not increase the probability of a deathly outcome, since presence of conflicts in the couple without violence has been identified as a protective factor.

Concerning crime opportunity theories, delinquency occurs at a time and place where there is a victim, a motivated aggressor and an absence of control. Thus, crime is not distributed in a random manner (Felson & Clarke 1998). The

risk factor of being the victim alone with the aggressor inside a building is explained by this theory. Thus, the presence of the victim in a solitary place such as their home with the presence of the aggressor with intentions of ending her life is clearly an ideal situation for this to take place. The risk factor of cohabitation could be also linked with the fundamentals of the theory. It is due to the fact that partners that live together have more moments alone in the house. Furthermore, aggressors with possession or access to weapons have more probabilities to perpetrate gender-based murder. It could be considered a situational facilitator to this crime. Scientific evidence indicates that firearms is the riskiest instrument for this crime. However, in Spain more studies are necessary about it because the access and possession of firearms are not as common as other countries, so maybe it is not a risk factor.

This theory could explain why rural areas are a risk factor and urban areas are a protective factor of gender-based death. The professional services that attend victims are usually in urban areas, so women of rural areas have more difficulties to access them (Galllup-Black, 2005; Websdale, 1998). The number of crime control strategies is low and even absent in rural areas, and the same happens with police (Galllup-Black, 2005; Martz & Sarauer, 2000).

5.2. Discussion of the objective 2

The greater the number of risk factors of death, the greater the probability of gender-based death is. The greater the number of protective factors of death, the lower the probability of gender-based death is (Redondo & Pueyo, 2007). For instance, evidence reveals that presence of the risk factors low-medium socio-economic status and lack of work in the aggressor increase the probability of deaths. This probability is lower when they are presented separately (Cunha & Conçalves, 2016; Fernández & Echeburúa, 2005). The same occurs with, for example, the combination of immigration and substance abuse risk factors in the aggressors and the victim (Belfrage &Rying, 2004).

Notwithstanding the above, there are some factors associated with deaths that are neither risk nor protective factors. Thus, these do not determine whether

there is going to occur death or not. It is the combination of these factors that enhances the death result or prevent it, having them a joint and reciprocal influence together. In particular, these factors are severity of violence, frequency of the violence, crime of illegal detention for gender-based violence, crime of injuries for gender-based violence, crime of threats for gender-based violence, crime of sexual abuse for gender-based violence, crime of habitual violence for gender-based violence, criminal records of gender-based violence, criminal records of constraints for gender-based violence, non-custodial sentence, protection measures and rupture.

For the mentioned, gender-based death depends on the level of severity and frequency of violence; the absence or presence of illegal detention, injuries, threats, sexual abuse, habitual violence crimes of gender based-violence; the absence or presence of criminal records of gender-based violence -in general- and of constraints -in particular-; the absence or presence of non-custodial sentence, protection measures and rupture. As it can be observed, there is multiple groups of factors combinations that lead and do not lead to the death. This opens up the range of gender-based violence profiles by showing that a particular variable does not always have to be a risk or protective factor, but it depends on its combination with others.

Several studies have identified different typologies and profiles of aggressors and victims in intimate partner homicides. The study of Carmichael, Jamison, Bol, McIntyre & Velopulos (2018) differentiates two groups: premeditated and impulsive. The study of Dobash, Dobash, Cavanagh & Lewis (2004) identified also two groups, which are ordinary and non-ordinary killer. The study of Dixon, Hamilton-Giachritsis & Browne (2008) detects three groups of low criminality and low psychopathology, moderate-high criminality and high psychopathology, and high criminality and low-moderate psychopathology. The study of Kim, Gerber, Kim & Hasset (2018) reveals five groups named nontraditional intimate partner homicide, family homicide, traditional intimate partner homicide, premeditated homicide and non-premeditated homicide. The existence of typologies could also apply to gender-based deaths. Each of them would have specific risk and protective factors, or a different combination of them.

Thus, more research on this area is required to increase the knowledge of risk and protective factors of gender-based death and to help prevent.

Effective prediction and prevention labors would be obtained taking into account the diversity of combined factors. Scientific evidence has identified that around 75 per cent of aggressors and victims of gender-based deaths were in contact with health, social and even justice services for 12 months before the fatal result (Murphy, Liddel & Bugeja, 2015). The professionals of these services do not always detect the risk of death, being unable to avoid that result (Murphy, Liddel & Bugeja, 2015). This could be because the combination of risk and protective factors on death are not being taken into account. However, there are several cases identified by these professionals, but the result is due to ineffective prevention resources. In this connection, several studies identified that some prevention resources of violence against women are linked with the high level of deaths (Dugan & Rosenfeld, 2003). Academics on the area indicate that it is due to these programs not being developed by the actual scientific evidence (Dugan & Rosenfeld, 2003). However, one of the deficiencies could be that each gender-based violence case is conceived equal or similar to others, managing the risk and protective factors in the same way. Thus, the no-consideration of the risk and protective factors effect in combination with deaths could be an obstacle for the prevention.

The previously-mentioned information refers to secondary prevention programs to avoid the death of victims in risk. However, effective tertiary prevention programs are also required to avoid that those aggressors condemned for a gender-based violence crime reoffend and, therefore, end with the life of their victims. The scientific literature identified that, in some cases, after committing violence against their partners and being convicted for it, offenders kill them (Fraga, Mennicke & Van, 2019; Vittes & Sorenson, 2008). It is commonly an act of revenge to the victim for the legal consequences (Dugan et al, 2003). One study reveals that 11 per cent of aggressors of gender-based violence with protection or restraining order kill their victims (Vittes & Sorenson, 2008). These cases could have similar combination of factors that led to deaths versus these victims with a protection order that do not end up killed. A recent study reveals

that aggressors who have been released from prison for a crime of gender violence and end with the life of their victims present a set of common factors simultaneously. These factors are the aggressor and victim being alone at their home, both of them having a substance abuse, the victim having been previously injured by the aggressor, and the aggressor owning a firearm (Fraga, Mennicke & Van, 2019). The relevance to take into account the combination of factors is confirmed.

CHAPTER 6. LIMITATIONS OF THE STUDIES

The studies present some limitations, so the results must be contemplated considering them. First, the number of scientific studies on factors associated with gender-based deaths is low. In particular, the number of studies focusing on protective versus risk factors is considerably scarce. The same applies to environmental versus aggressor, victim and relationship factors. Thus, the identification of few protective factors associated with deaths does not mean that the number of risk factors are higher than them. It is the same with the environmental factors, which could be more associated with the deaths than aggressor, victim and relationships factors but there are not studies that confirm or deny it. What is more, there are some inconsistencies in the results of certain studies. Therefore, in spite of the existing studies contributing to the knowledge about gender-based deaths, there is still lack of studies that refute or validate those present.

Secondly, most studies of the systematic review are carried out in different countries, which make it difficult to extrapolate the results to Spain. The countries of the studies have differentiated elements such as culture and law. Culture influences values, beliefs, feelings, customs and many other aspects of people's lives (Phillip, 2011). Thus, culture acts as a modeling or regulating agent of human behaviors, including criminal behavior. Thus, the fact that there are studies conducted in social contexts with different cultures may lead to explanations provided on the criminal behaviors of gender-based deaths not being representative in our country.

Culture also determines the law by establishing which behaviors are appropriate and which are illicit (Phillip, 2011), being them reflected in the legal system of each country. Thus, in the different countries in which the studies have been conducted, the same crime of violence against women could be included in their legislation. However, it could have different connotations and characteristics. For example, the seriousness of the crime of violence against women and, therefore, its punishment, may differ from a country to other. Moreover, the risk assessments and protection protocols could be different in

each country. This may affect the commission of the crime of gender-based death. Therefore, study 2, having been carried out with a Spanish sample, overcome the mentioned limitation.

Third, the studies have methodological limitations. The studies included in the systematic review are based on classical statistic that consider the data obtained to be linear. In this field of study, the data tends to be nonlinear and therefore a careful interpretation of the results is necessary. Study 2 takes into account the non-literal nature of the data and uses methods to analyze them, which is an attempt to overcome the mentioned limitation. However, the methodology of study 2 has also limitations. It has not been possible due to lack of time to develop a FCBF and ranker analysis nor a large scale comparison of decision trees for each database. It calls for a cautious interpretation of the results.

In addition, most studies are non-probabilistic, which makes it difficult to generalize the results obtained. In addition, the sample size is limited in number and could not include cases that are representative of the population study. Specifically, the studies have a sample from official data or accessible cases of gender-based violence. However, it should be borne in mind that there are unrecorded crimes of cases of gender-based violence and it is not included in the studies. However, it is true that the cases of unrecorded deaths are low.

Fourth, study 2 is based on facts that have been proven, so its objectivity is unquestionable. However, there may have been events that have not been officially recorded because they have not been proven, but this does not mean that they did not occur. The opposite occurs with some research of study 1, as it is based on the perceptions of victims and aggressors, which may not correspond to the objective reality. Both cases imply a lack of information, which must be taken into account.

Fifth, the studies are composed of adult participants, excluding adolescents and elderly people. For this reason, the results obtained cannot be extrapolated to this group of people.

Sixth, the new reality with the pandemic could render ineffective some of the risk and protective factors identified in the study. Furthermore, it could be accompanied of new risk and protective factors of gender-based deaths which have not been identified yet by the literature review. A recent study indicated that confinement aggravates violence against women. The aggressor takes advantage of the opportunity to increase violence and control over the woman. He knows that he is likely to go unpunished because of the victim's barriers to communicate with others for help and reporting (Lorente-Lacosta, 2020). This whole situation should be studied in relation to the deaths that have occurred during the pandemic. Since home confinement continues to occur at the moment, it would help to prevent deaths in women confined with their aggressors.

CHAPTER 7. FURTHER RESEARCH

The present study identifies the need for additional research into gender-based deaths due to the identified factors by the scientific studies not being sufficiently refuted nor validated. Moreover, it is necessary to research and verify if the factors identified in the studies are still risk and protective in the pandemic reality.

Furthermore, there is need for more studies given that there are still unstudied factors associated with gender-based deaths. In particular, the studies on how the media affect deaths are relevant; however, they have not been found. The content and media treatment of gender-based violence can have an impact on deaths. For instance, the media could encourage the victims of gender-based violence to stop it and report, preventing deaths. However, the effect could not be protective, but endanger the victim even more. It is the case of Ana Orantes, who was murdered by her ex-husband in Spain after sharing in the media about the gender-based violence she was receiving.

Studies of dating apps associated with gender-based deaths are also required. At the moment, the use of these apps is common to meet partners and it could be related with gender-based violence and even gender-based deaths. Moreover, studies focusing on the relationship between violence against the children – biological or not – and gender-based deaths must be performed. In the sentences revised previously, some cases of gender-based violence deaths were accompanied by violence not only against women, but also against children. Moreover, in these sentences was observed that there are several cases of minors who call the police and it prevent the death of their mother. No studies have been found about that.

Attention should be paid not only to unstudied factors but also to unstudied populations. There are very few studies on gender-based deaths in adolescent and elderly partners (Adhia, Kernic, Hemenway, Vavilala & Rivara, 2019; Warmling, Rubia & Berger, 2017). It is necessary to focus on them in the future.

CHAPTER 8. CONCLUSIONS

The present study makes a contribution to the knowledge of risk and protective factors for gender-based deaths, updating it. Mainly, it refutes and validates the results of the unique systematic review carried out by Contreras (2014), and reveals new factors do not know so far.

The main result of the study reveals that there are individual risk factors of aggressor, victim, partner's relationship and environment of gender-based deaths. For example, rupture, stalking, submissive victim, aggressor with substance abuse, aggressor with biased cognitions of violence and subordination of men to women, injuries or deaths threats, sexual violence, immigration, and possession of weapons. There are also individual protective factors of aggressor, partner's relationship and environment of the same study phenomenon. Mainly, non-rupture of relationship, couple's conflicts without violence, and residence in urban areas.

Certain individual factors in combination with others enhance the death result or subside it, depending on the nature and number of grouping factors. Specifically, gender-based death depends on the combination of the factors severity of violence, frequency of violence, illegal detention crime of gender based-violence, injuries crime of gender based-violence, threats crime of gender based-violence, sexual abuse crime of gender based-violence, habitual violence crime of gender based-violence, criminal records of gender-based violence -in general-, criminal records of constraints -in particular-, non-custodial sentence, protection measures and rupture.

The obtained knowledge is essential for a more effective prediction and prevention of future gender-based deaths, contributing the present research to saving women lives.

CHAPTER 9. APPENDICES

Appendix 1. MMAT checklist for quality assessment (Hong et al, 2019).

Quantitative studies							
	Quality criteria						
	Clear research questions	The collected data allow to address the research questions	The sampling strategy is relevant to address the research question	The sample is representative of the target population	The measurements are appropriate	The risk of nonresponse bias is low	The statistical analysis is appropriate to answer the research question
Decker et al, 2004		X	X	X	X	X	X
Belfrague & Rying, 2004	X	X	X	X	X	X	X
Cunha & Gonçalves, 2016				X	X	X	X
Kikivuori & Lehti, 2012		X	X	X	X	X	X
Reckdenwald et al, 2019				X	X	X	X
Sebire, 2017				X	X	X	X
Ward-Lasher et al, 2020		X	X	X	X	X	X
McFarlane et al, 1999				X	X	X	X
Vatnar & Bjørkly, 2013	X	X	X	X	X	X	X

Soria-Verde et al, 2019				X	X	X	X
Fernández & Echeburúa, 2005				X	X	X	X
Aguilar, 2019				X	X	X	X
Soares & Abrunhosa, 2016				X	X	X	X
Johnson et al, 2020				X	X	X	X
Abrunhosa et al, 2020				X	X	X	X

Qualitative studies							
	Quality criteria						
	There are clear research questions	The collected data allow to address the research questions	The qualitative approach is appropriate to answer the research question	The qualitative data collection methods are adequate to address the research question	The findings are adequately derived from the data	There is interpretation of results sufficiently substantiated by data	There is coherence between qualitative data sources, collection, analysis and interpretation
Dobash & Dobash, 2011		X	X	X	X	X	X
Nicolaidis et al, 2003		X	X	X	X	X	X
Bagwell-Gray, 2016				X	X	X	X
Monckton, 2019	X	X	X	X	X	X	X

Mixed studies							
	Quality criteria						

	There are clear research questions	The collected data allow to address the research questions	There is an adequate rationale for using a mixed methods design to address the research question	The different components of the study are effectively integrated to answer the research question	The outputs of the integration of qualitative and quantitative components are adequately interpreted	Divergences and inconsistencies between quantitative and qualitative results are adequately addressed	The different components of the study adhere to the quality criteria of each tradition of the methods involved
Dobash & Dobash, 2016	X	X	X	X	X	X	
Vatnar et al, 2019	X	X	X	X	X	X	X

Appendix 2. Risk and protective factors according to the scientific articles of the study 1.

Article	Country	Sample number	Sample characteristics	Methodology	Instrument source	Results
Decker et al (2004)	USA	53 women	Women victims of gender-based violence recruited from two prenatal care clinics in North Carolina (USA) who suffered physical violence by her male partner during prenatal routine care.	Prospective study	Interviews using the Danger Asessment Instrument (Campbell, Soeken, MacFarlane & Parker,1998).	Risk factors: – Men with drug abuse. – Jealous men. – Men with violent behaviours to another people. – Controller men. – Death threats from the man to the woman. – Separation during pregnancy months and violence the year before pregnancy. – Controlled couple`s relationship by the male partner. Protective factors: – Continuing the partnership during pregnancy moths.
Dobash & Dobash (2011)	UK	104 men	Men murders from Britain prisons convicted of murdering a marital, ex-marital, girlfriend, ex-girlfriend or serious dating relationship.	Retrospective study	Interviews and official police, forensic, judicial, health, social and educational data.	Risk factors: – Men with a history of violence to previous intimate partners. – Men with relationship problems. – Men with authority and control needs. – Men with strong cognitions bias about subordinate position of women to men and its normalization. – Men with high possessiveness and jealousy. – Men with a fear to abandonment. – Men with cognitions that justify the violence and minimize its severity and denial of the responsibility blaming the victim or deflecting the responsibility to another factors. – Men with lack of empathy and remorse.

						– History of serious violence to the woman by the male partner. – An early, persistent and severe violence in the partnership. – Separation. – Couple's relation charactered by conflicts and possessive and control acts by the male partner.
Belfrage & Rying (2004)	Sweden	854 men	The sample was collected by 164 men perpetrators of spousal homicide and 690 other perpetrators homicide committed from 1990-1999 years which was recruited from the Sweden Police Register.	Retrospective study	Official police and forensic data	Risk factors: – Men with substance abuse. – Men and women immigrant. – Men with criminal records. – Men with a psychiatric diagnose. – Separation. – Threats from the male to the female partner. – Be in home.
Cunha & Gonçalves (2016)	Portugal	187 men	Men convicted to violence against women recruited from different institutions of Portugal (50 men committed severe violence and 137 less severe violence).	Retrospective study	Official casefiles, interviews and questionaries The Brief Symptoms Inventory (Derogais, 1993), The Marital Violence inventory (Machado, Gonçalves & Matos, 2007), the Buss-Perry Aggression Questionnaire	Risk factors: – Men with a low-medium socioeconomic status. – Use of guns by the men. – Separation. – Men with previous intimate partner violence. – Threats with guns by the male to the female partner. – Women with injuries which need medical assistance. – Men with persecuting acts to the women.

					(Buss & Perry, 1992) and the Hare Psychopathy Checklist-Revised (Hare, 1991).	
Kivivuori & Lehti (2012)	Finland	836 men	Murders composed by men who kill women, women who kill men, men who kill men, women who kill women and men and women who kill family members.	Retrospective study	Official from Finnish Homicide Monitoring System database	Risk factors: – Men unemployed or with a pension. – Men with alcohol and/or drug abuse. – Men with knowledge to become violent when is intoxicated. – Men with criminal records and judicial convictions. – Previous intimate partner violence.
Nicolaidis et al (2003)	USA	30 women	USA women survivors of attempted homicide by an intimate partner for the years 1994-2000.	Retrospective study	Interviews	Risk factors: – Jealous men. – Excessive controller men. – Women with injuries. – Social isolation of women. – Women with desires to end the couple's relation. – History of physical, psychological and sexual violence from the male to the female partner. – Escalating frequency and severe of violence. – Partnership controlled by the male partner. – Death and injury threats with guns. – Stalking behaviours by the male to the female partner.

Bagwell-Gray (2016)	USA	8 women	Women of gender violence who have experienced attempted homicide.	Retrospective study	Interviews	Risk factors: – Using weapons by the male partner to control female partner. – Non-consent sex by the women. – Couple`s relation with sexual violence. – Women has not control on the sex relation. – Couple`s relation controlled exclusively by the male partner. – Extremally jealous men. – Prior intimate partner violence. – Women with physical injuries. – Strangulations. – Death threats with guns.
Reckdenwald, et al (2019)	USA	2,613 women	Women killed by their intimate partners between 2005 and 2013 cases perpetrated in rural and urban areas in USA.	Retrospective study	Official data from the USA National Violent Death Reporting System	Risk factors: – Men uses firearms. – High opposed to the former woman by the man. – Women has multiple wounds and injuries into face, head and neck. – Residence in rural area. Protective factors: – Residence in urban area.
Sebire (2017)	UK	207 men and women	207 male and female offenders and victims' cases of intimate partner homicide between 1998 and 2009.	Retrospective study	Interviews and official police data	Risk factors: – Men with criminal convictions. – Men unemployed, househusband or retired. – Men older than the female partner. – Women with drug and alcohol abuse. – Women unemployed, housewife or retired. – Partnership over 3 and below 10 years. – Married couple. – Presence of stepchildren.

Ward-Lasher, et al (2020)	USA	266 women	Victims of gender violence between 2009 and 2010 which some aggressors were arrested by police.	Prospective study	Victim interviews using The Conflict Tactics Scale-2 (Straus, 1996) and Danger Assessment (Messing, Campbell, and Snider, 2017)	Risk factors: – Immigrant men. – Unemployed men. – Men arrested previously.
Monckton (2019)	UK	25 women	The women were victims of intimate partner homicide between 2005-2020 in UK selected using the Counting Dead Women database (Smith, 2018)	Retrospective study	Media report and documentaries, official judicial data, and interviews	Risk factors: – Men with a history of controlling patterns. – Men with criminal and arrest records. – Men with a history of domestic abuse. – Progressive possessiveness and control from the male partner to the female partner. – Men with imaginations of the separation. – Men with cognitive justifications. – Male partner with perception of lost control partnership. – Men with purchase weapons. – Attempts to isolate the female partner by the male partner. – Female partner complies with the coercive control demands of the male partner. – Female partner advertises her desires of finish the relation to the male partner. – Couple`s relationship with prior violence. – Escalation of frequency, severity and variety of violence. – Stalking and sexual violence by the man to the woman. – Extreme subordinate relation from the male to the female partner. – Separation. – Threats. – Friends of the man who know of the violence patterns and do not denounce to police.

Dobash & Dobash (2016)	UK	105 men	Murders of women intimate partners from UK prisons which were divided in two groups. First, men with previous conviction and second, men without it.	Retrospective study	Interviews and official police, judicial, social, educational, and health data.	Risk factors: – Possessiveness men. – Men with rationalizations and justifications to violence. – Men with family problems in the childhood. – Men partner with behavioural and/or learning problems at school. – Men physically abused in the childhood. – Men with drug and alcohol abuse. – Men with a history of criminal offences and being in contact with criminal justice and being in a criminal justice institution for that. – Men with sexual problems. – Men with lack of empathy. – Separation. – Cohabiting. – Serious relationship. – Ongoing disputes. – Previous violence from the man to the woman. – Sexual abuse relation.
Vatnar et al (2019)	Norway	177 men and women	Victims and aggressors with and without drug and/or alcohol abuse involved in IPH in Norway from 1990-2012 period.	Retrospective study	Official judicial data	Risk factors: – Men and women with alcohol, drugs or both influence at the same time.
McFarlane et al (1999)	USA	208 women	Killed and attempted survivors' victims of intimate partner homicide between 1994 and 1998.	Retrospective study	Interviews, official judicial data and stalking questionary (Tjaden &Thoennes, 1998; Sheridan, 1998).	Risk factors: – Several stalking behaviours repeated in the time from the man to the woman. – Prior physical abuse by the man to the woman. – Separation.

Vatnar & Bjørkly (2013)	Norway	157 women	Victims of intimate partner homicide from Norway from 1990-2012.	Retrospective study	Interviews	Risk factors: – Female partner with perceptions that her life is in danger during the physical, psychological or sexual abuse. – Physical, psychological and sexual abuse severe and frequent from the man to the woman. – Threats of killing by the male partner.
Soria-Verde et al (2019)	Spain	168 men	118 Spanish and 50 immigrant aggressors of intimate partner homicide between 2000 and 2011	Retrospective study	Official judicial data	Risk factors: – Men with criminal records. – Presence of stepchildren. – Partner discussions. – Separation. – Be in home.
Fernández & Echeburúa (2005)	Spain	162 men	Men serving a prison sentence for a severe intimate partner violence or homicide in Spain.	Retrospective study	Inventario de Pensamiento Distorsionados sobre la Mujer (Echeburúa & Fernández-Montalvo, 1998), Inventario de Pensamientos Distorsionados sobre el Uso de la Violencia (Echeburúa y Fernández-Montalvo, 1998), Índice de Respuesta Interpersonal (IRI) (Davis, 1980), Guía	Risk factors: – Men with many distorted ideas about the women and about the violence as an acceptable form of resolve the problems. – Men with elementary education. – Men with a low-medium socioeconomic level. – Separation or divorce.

					para la Estimación del Riesgo de Violencia (VRAG), Listado de Síntomas (SCL-90) (Derogatis, 1975; González de Rivera, 2002), Escala de Psicopatía (PCL-R) (Hare, 1991; Moltó & Torrubia, 2000), Inventario de Manifestación de la Ira Rasgo-Estado (Spielberger, 19888; Miguel-TObal, Casado, Cano-Vindel & Spielberger, 2001) and Escala de Impulsividad (BIS-10).	
Aguilar (2019)	Spain	307 men	Men with a condemnatory sentence for consummate or attempt intimate partner homicide between 2012 and 2015 in Spain.	Retrospective study	Official judicial data	Risk factors: – Jealous men. – Male partner with excessive stress for denounces, knowledge or imagination that the female partner is with another man and economic problems. – Men with access to weapons. – Men with mental illness. – Separation. – Stalking from the male partner to the female partner. – Threats of killing by the male partner. – Controlled relation by the male partner.

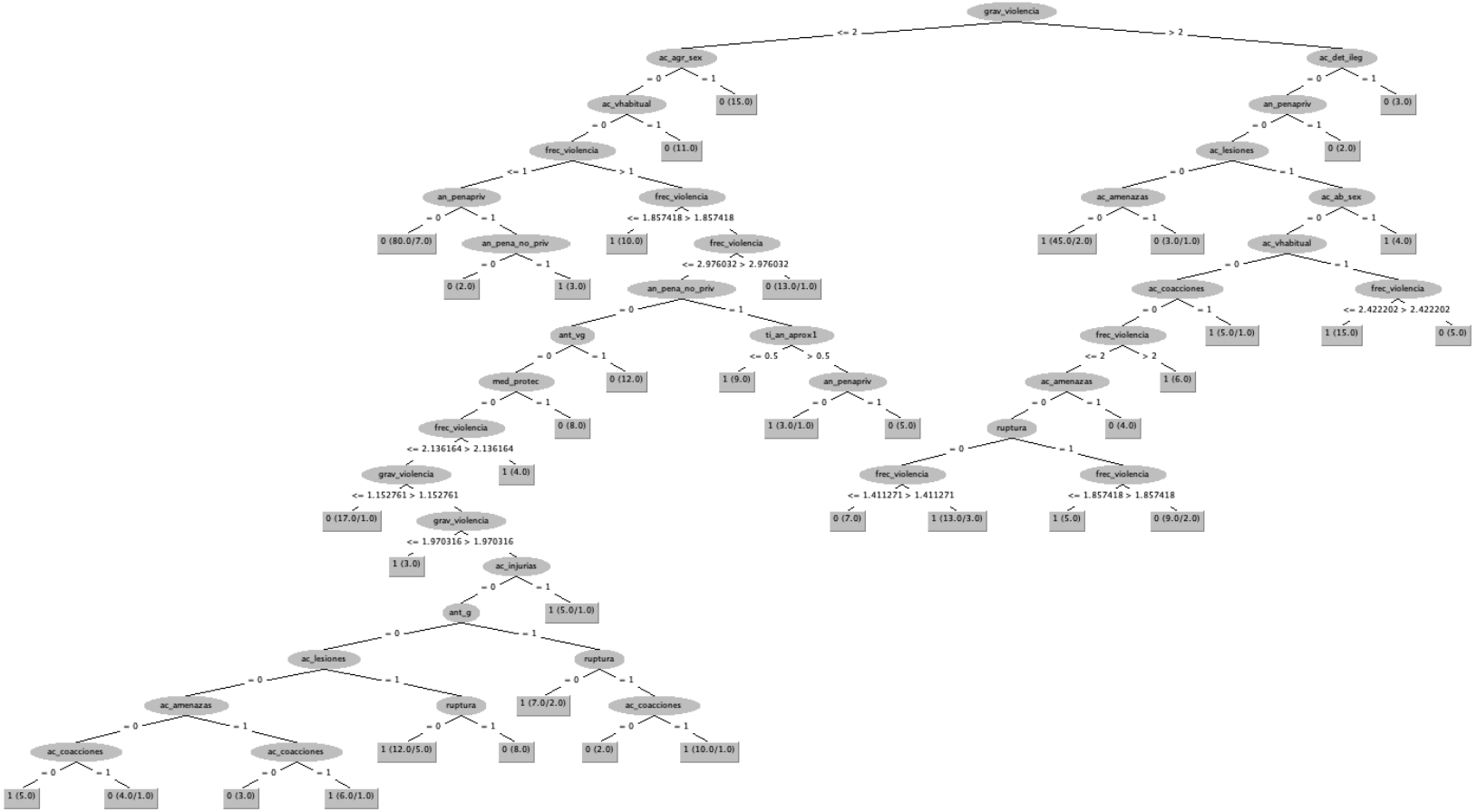
						Protective factors: – Not previous violence. – Couple's conflicts without violence.
Soares & Abrunhosa (2016)	Portugal	172 men	137 aggressors of intimate partner violence and 35 of intimate parent homicide recruited from Portuguese prison and community services.	Retrospective study	Spousal Abuse Risk Assessment (SARA) (Kropp, Hart, Webster & Eaves, 1998)	Risk factors: – Men with drug or alcohol abuse. – Men with suicidal ideation or intent. – Past use of weapons by the men. – Men with cognitive minimization or denial of violence against the partner. – Men with a personality disorder. – Jealous men. – Men older than the women. – Threats of death by the male partner. – Past physical and sexual violence from the male partner to the female partner. – Escalation of violence. – Men and women with a marital status. Protective factors: – No single status. – Men with a past conditional release or community supervision which has violated. – Being a victim or witness in the childhood of family violence.
Johnson et al (2020)	USA	213 women	Victims of attempted intimate partner homicide from USA.	Retrospective study	New Jersey Assessment of Domestic Violence Risk and Impact (NJADVRI) (Johnson, Cusano, Nikolova, Steiner, & Postmus, 2020)	Risk factors: – Male partner with control behaviours on the female partner daily life. – Men with access to a gun. – Men with drug abuse. – Violent men. – Jealous men. – Female partner with unsafe feelings to perceive that the male partner is capable to kill her.

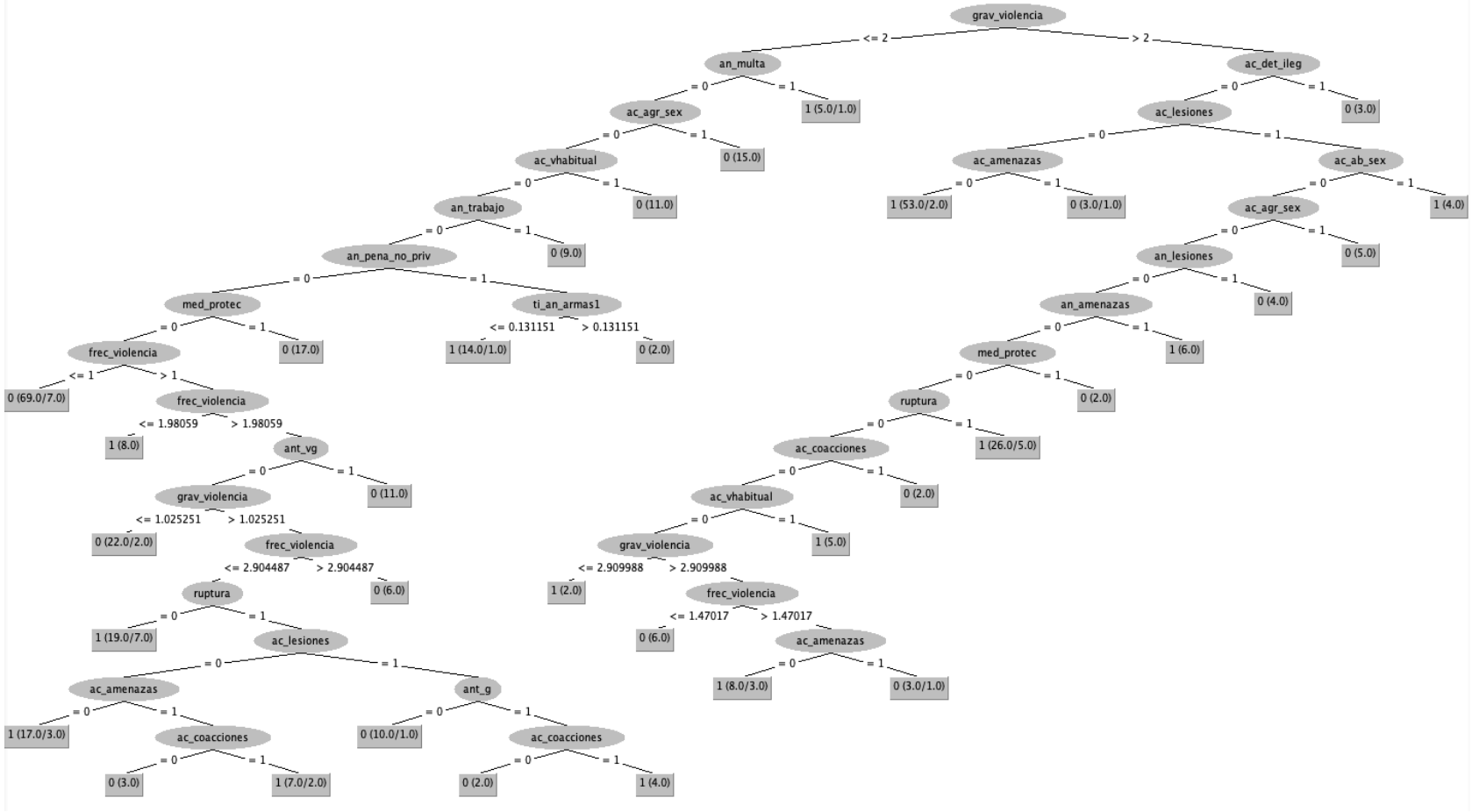
						– History of physical, emotional and economic abuse by the male partner to the female partner. – An increase of severity and frequency of violence. – Stalking from the male partner to the female partner. – Threats to kill by the male partner to the female partner.
Abrunhosa et al (2020).	Portugal	245 men	Aggressors of intimate partner violence and intimate partner homicide recruited from Portuguese prisons and community services.	Retrospective study	Interviews, official judicial data and the Brief Symptoms inventory (BSI) (Canavarro, 1999; Derogatis, 1993), the Marital Violence Inventory (IVC) (Machado, Gonçavlves & Matos, 2007) and the Hare Psychopathy Checklist-Revised (PCL-R) (Golçalves, 1999; Hare, 1991)	Risk factors: – Men uses weapons. – Men has perpetrated other crimes. – Men with prior history of violence. – Separation or divorce. – Not children.

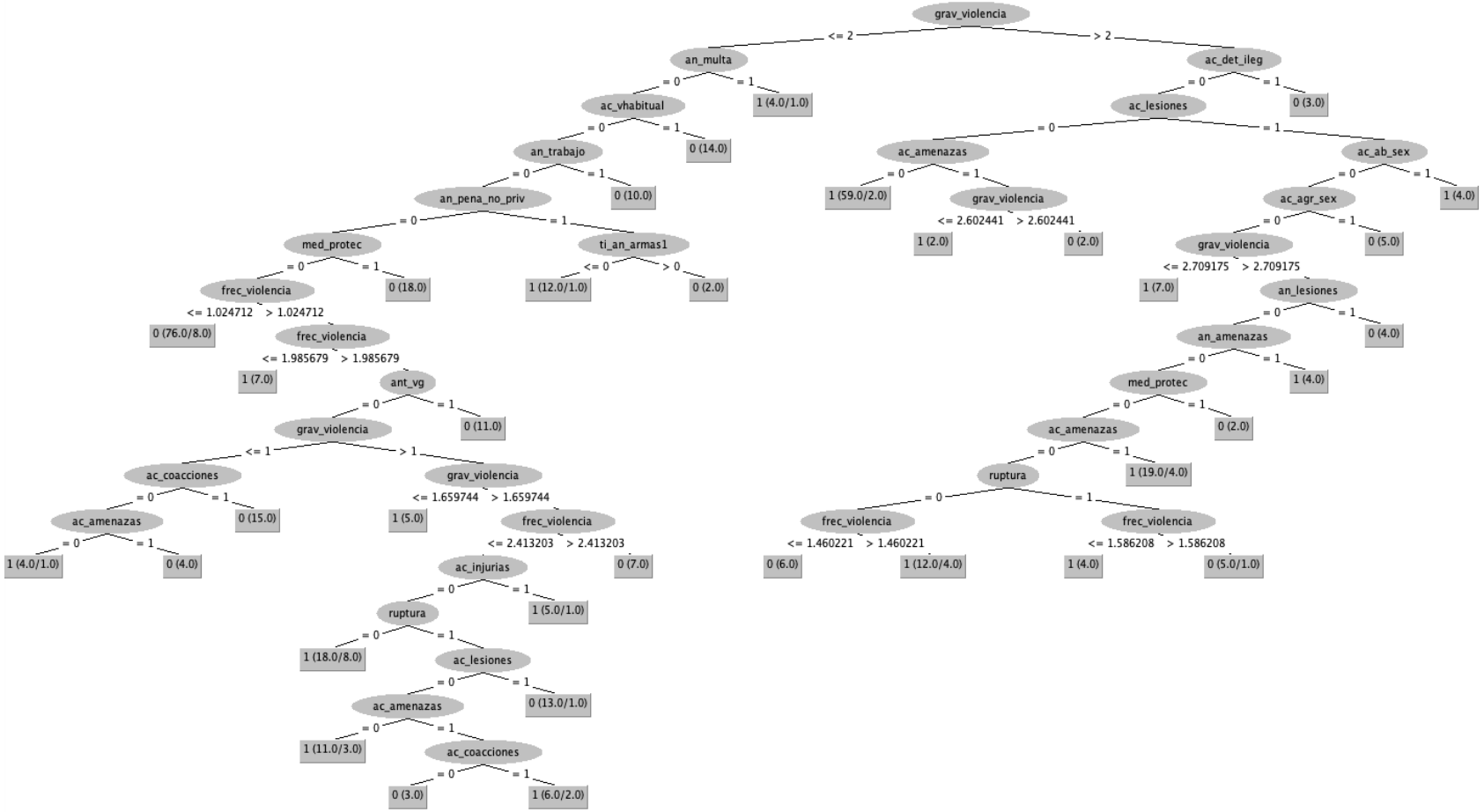
Appendix 3. J48 visual graphs from over-sampling subsets.

Graphs' legend:

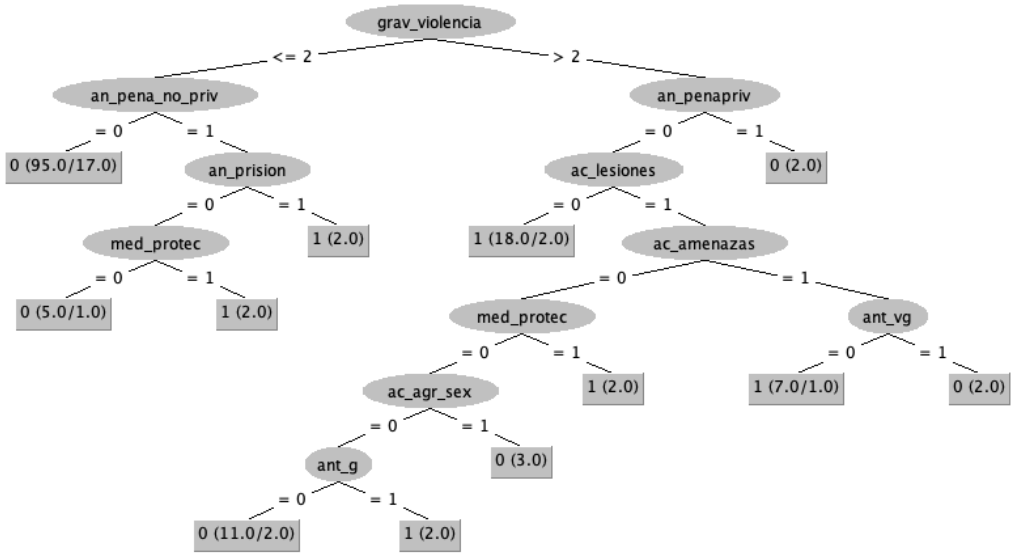
- Ac_ab_sex: crime of sexual abuse for gender-based violence.
- Ac_agr_sex: crime of sexual aggression for gender-based violence.
- Ac_amenazas: crime of threats for gender-based violence.
- Ac_coacciones: crime of constraints for gender-based violence.
- Ac_det_ileg: crime of illegal detention for gender-based violence.
- Ac_injurias: crime of insults for gender-based violence.
- Ac_lesiones: crime of injuries for gender-based violence.
- Ac_vhabitual: crime of habitual violence for gender-based violence.
- An_multa: fine sentence.
- An_pena_no_priv: non-custodial sentence.
- An_penapriv: custodial sentence.
- An_trabajo: community service sentence.
- Ant_g: general criminal records.
- Ant_vg: criminal records of gender-based violence.
- Frec_violencia: frequency of violence.
- Grav_violencia: severity of violence.
- Med_protec: protection measures.
- Ruptura: rupture.
- Ti_an_aprox1: time prohibition of approximation the victim sentence.
- Ti_an_armas1: time deprivation of the right to possess and carrying of weapons sentence.

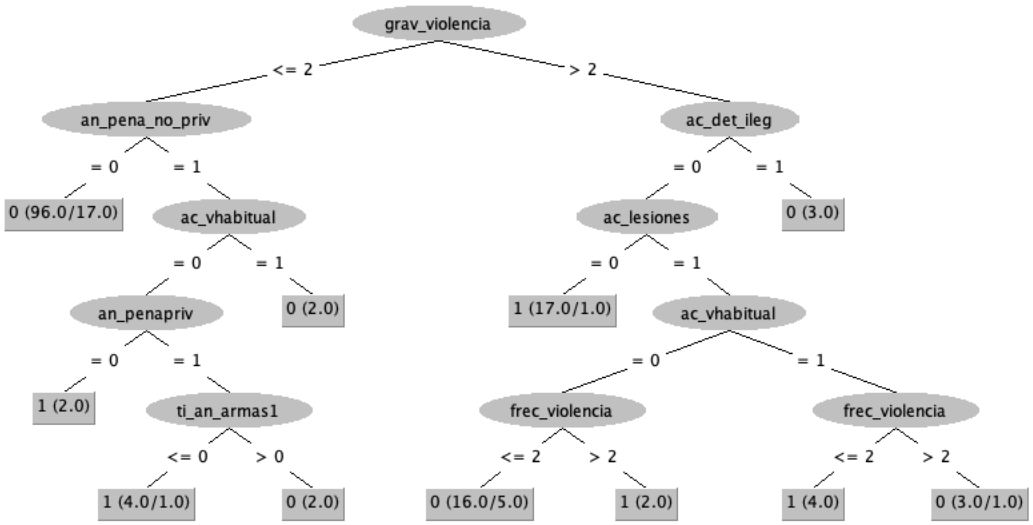

grav_violencia
<= 2
> 2
ac_agr_sex
= 0
= 1
0 (15.0)
ac_vhabitual
= 0
= 1
0 (11.0)
frec_violencia
<= 1
> 1
an_penapriv
= 0
= 1
0 (80.0/7.0)
an_pena_no_priv
= 0
= 1
0 (2.0)
1 (3.0)
frec_violencia
<= 1.857418
> 1.857418
1 (10.0)
frec_violencia
<= 2.976032
> 2.976032
0 (13.0/1.0)
an_pena_no_priv
= 0
= 1
ant_vg
= 0
= 1
0 (12.0)
med_protec
= 0
= 1
0 (8.0)
frec_violencia
<= 2.136164
> 2.136164
grav_violencia
1 (4.0)
<= 1.152761
> 1.152761
0 (17.0/1.0)
grav_violencia
<= 1.970316
> 1.970316
1 (3.0)
ac_injurias
= 0
= 1
1 (5.0/1.0)
ant_g
= 0
= 1
ac_lesiones
= 0
= 1
ruptura
= 0
= 1
1 (7.0/2.0)
ac_amenazas
= 0
= 1
ruptura
= 0
= 1
ac_coacciones
= 0
= 1
ac_coacciones
= 0
= 1
ac_coacciones
= 0
= 1
1 (5.0)
0 (4.0/1.0)
0 (3.0)
1 (6.0/1.0)
1 (12.0/5.0)
0 (8.0)
0 (2.0)
1 (10.0/1.0)
ti_an_aprox1
<= 0.5
> 0.5
1 (9.0)
an_penapriv
= 0
= 1
1 (3.0/1.0)
0 (5.0)
ac_det_ileg
= 0
= 1
0 (3.0)
an_penapriv
= 0
= 1
ac_lesiones
= 0
= 1
0 (2.0)
ac_amenazas
= 0
= 1
ac_ab_sex
= 0
= 1
1 (45.0/2.0)
0 (3.0/1.0)
ac_vhabitual
= 0
= 1
1 (4.0)
ac_coacciones
= 0
= 1
frec_violencia
1 (5.0/1.0)
frec_violencia
<= 2.422202
> 2.422202
1 (15.0)
0 (5.0)
frec_violencia
<= 2
> 2
ac_amenazas
= 0
= 1
1 (6.0)
ruptura
= 0
= 1
0 (4.0)
frec_violencia
<= 1.411271
> 1.411271
frec_violencia
<= 1.857418
> 1.857418
0 (7.0)
1 (13.0/3.0)
1 (5.0)
0 (9.0/2.0)


grav_violencia
<= 2
> 2
an_multa
ac_det_ileg
= 0
= 1
1 (5.0/1.0)
ac_agr_sex
ac_lesiones
0 (3.0)
= 0
= 1
0 (15.0)
ac_vhabitual
ac_amenazas
ac_ab_sex
= 0
= 1
0 (11.0)
1 (53.0/2.0)
0 (3.0/1.0)
1 (4.0)
an_trabajo
ac_agr_sex
0 (9.0)
0 (5.0)
an_pena_no_priv
an_lesiones
0 (4.0)
med_protec
ti_an_armas1
an_amenazas
frec_violencia
<= 0.131151
> 0.131151
1 (6.0)
0 (17.0)
1 (14.0/1.0)
0 (2.0)
med_protec
<= 1
> 1
0 (69.0/7.0)
frec_violencia
0 (2.0)
ruptura
<= 1.98059
> 1.98059
1 (8.0)
ant_vg
ac_coacciones
1 (26.0/5.0)
0 (11.0)
0 (2.0)
grav_violencia
ac_vhabitual
<= 1.025251
> 1.025251
1 (5.0)
0 (22.0/2.0)
frec_violencia
grav_violencia
<= 2.904487
> 2.904487
<= 2.909988
> 2.909988
0 (6.0)
1 (2.0)
frec_violencia
ruptura
<= 1.47017
> 1.47017
1 (19.0/7.0)
0 (6.0)
ac_amenazas
ac_lesiones
1 (8.0/3.0)
0 (3.0/1.0)
ac_amenazas
ant_g
1 (17.0/3.0)
0 (10.0/1.0)
ac_coacciones
ac_coacciones
0 (3.0)
1 (7.0/2.0)
0 (2.0)
1 (4.0)


grav_violencia
<= 2
> 2
an_multa
ac_det_ileg
= 0
= 1
1 (4.0/1.0)
ac_vhabitual
ac_lesiones
0 (3.0)
= 0
= 1
0 (14.0)
an_trabajo
ac_amenazas
ac_ab_sex
= 0
= 1
0 (10.0)
an_pena_no_priv
1 (59.0/2.0)
grav_violencia
ac_agr_sex
1 (4.0)
= 0
= 1
med_protec
ti_an_armas1
<= 2.602441
> 2.602441
1 (2.0)
0 (2.0)
grav_violencia
0 (5.0)
0 (18.0)
1 (12.0/1.0)
<= 0
> 0
0 (2.0)
<= 2.709175
> 2.709175
frec_violencia
an_lesiones
1 (7.0)
<= 1.024712
> 1.024712
0 (76.0/8.0)
frec_violencia
0 (4.0)
an_amenazas
<= 1.985679
> 1.985679
1 (4.0)
1 (7.0)
ant_vg
med_protec
0 (11.0)
0 (2.0)
grav_violencia
ac_amenazas
<= 1
> 1
1 (19.0/4.0)
ac_coacciones
grav_violencia
ruptura
0 (15.0)
<= 1.659744
> 1.659744
frec_violencia
frec_violencia
1 (5.0)
<= 2.413203
> 2.413203
0 (6.0)
1 (12.0/4.0)
1 (4.0)
0 (5.0/1.0)
ac_amenazas
0 (7.0)
ac_injurias
1 (4.0/1.0)
0 (4.0)
1 (5.0/1.0)
ruptura
1 (18.0/8.0)
ac_lesiones
0 (13.0/1.0)
ac_amenazas
1 (11.0/3.0)
ac_coacciones
0 (3.0)
1 (6.0/2.0)

Appendix 4. J48 visual graphs from under-sampling subsets.




grav_violencia
<= 2
> 2
an_pena_no_priv
ac_det_ileg
= 0
= 1
= 0
= 1
0 (96.0/17.0)
ac_vhabitual
ac_lesiones
0 (3.0)
= 0
= 1
= 0
= 1
an_penapriv
0 (2.0)
1 (17.0/1.0)
ac_vhabitual
= 0
= 1
= 0
= 1
1 (2.0)
ti_an_armas1
frec_violencia
frec_violencia
<= 0
> 0
<= 2
> 2
<= 2
> 2
1 (4.0/1.0)
0 (2.0)
0 (16.0/5.0)
1 (2.0)
1 (4.0)
0 (3.0/1.0)

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